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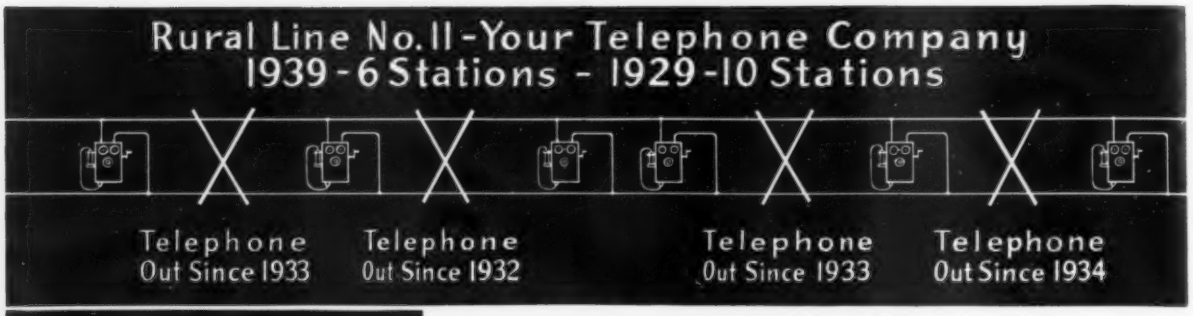
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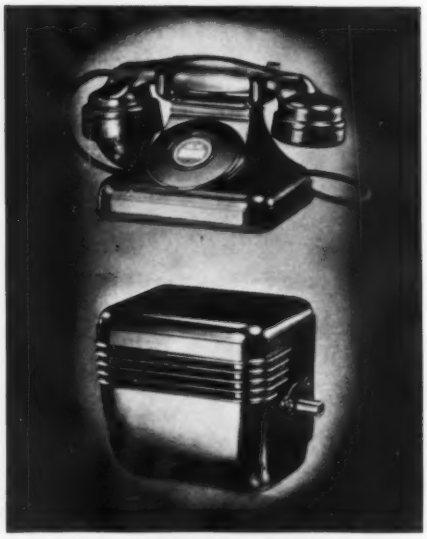

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VACUUM TUBES

As Voltage Amplifiers

By **ARTHUR L. ALBERT**
Professor of Communication Engineering, Oregon State College

***FIFTH OF A SERIES** of articles on electronics and electronic devices used in telephone work. This section discusses the theory of voltage amplifiers and their simple method of design for application in the telephone field, using triodes, tetrodes and pentodes. The preceding articles in this series were published February 11, March 4, March 25 and July 1*

SINCE about 1914 vacuum tubes have been used as amplifiers in telephone circuits. This was the first important use in telephony and, strange as it may seem (see TELEPHONY, March 26, 1938), the present indications are that it may be its final use. This may come to pass because the copper-oxide varistor has replaced the vacuum tube as a modulator and demodulator in the new carrier systems, and magnetic means instead of vacuum-tube oscillators are used to generate the carrier frequencies.

From this it should not be inferred that the vacuum tube is "slipping" in its importance in the telephone plant. It is turning over certain duties to other devices, but its importance as an amplifier warrants its careful consideration. No practical device has yet been found which will perform distortionless amplification better than the vacuum tube.

Voltage vs. Power Amplifiers

In discussing amplifiers, it is helpful to separate them into two types. Voltage amplifiers are those designed primarily to increase a weak signal voltage until it is of sufficient amplitude to control the output of a power-amplifying tube. This distinction is quite clear in radio and other fields such as sound amplification, but is not so evident in amplifiers for telephone repeaters.

In the repeaters of the ordinary type now generally in service, the amplification at any given point is quite low compared to the amplification in a radio-receiving set. Also, the power output of a repeater is low compared to the power output of a radio set or a sound-system amplifier. Thus, a distinction between voltage and power amplification is not so evident or so important; a single vacuum tube may increase both.

In the new cable systems, however, higher amplification is introduced at each repeater point, and the distinction between voltage amplifying and power-output tubes is more apparent. But even if this were not true, clarity and simplicity of treatment justifies such a distinction. Accordingly, this article will treat vacuum tubes as voltage amplifiers, and the following article will discuss power amplification.

The purpose of voltage amplification is to obtain a strong output voltage which is an exact replica of the impressed signal voltage. Of course some distortion occurs, but this is kept low by operating the tube on the (essentially) straight portion of the grid voltage-plate current curve of Fig. 1. If the impressed grid voltage is a sine wave as shown, the resulting current flow will contain an alternating component.

The reason for distortion is apparent from Fig. 1. Thus, the maximum positive value of the alternating grid voltage just drives the grid to zero potential, and the maximum *negative* value drives the grid to the curved part of the characteristic. If the impressed grid voltage is increased in magnitude, then the grid will be driven positive, and grid current will flow.

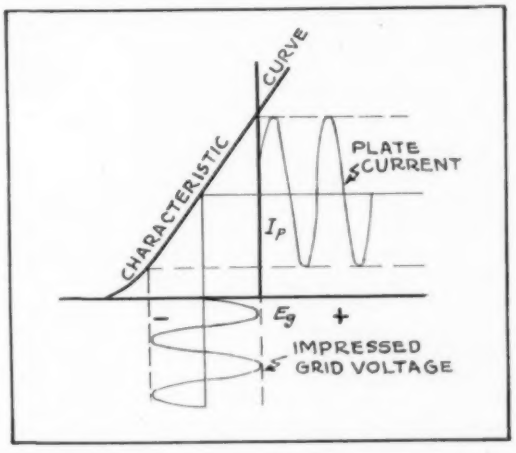

Fig. 1. When the alternating grid signal voltage is impressed, an alternating component will exist in the plate current as indicated.

This will cause distortion unless the source of the grid signal voltage has good regulation and can supply the current and at the same time maintain the grid voltage just as if no grid current flowed. Usually, this cannot be done. Also the increased grid signal voltage will drive the grid negative to the curved portion of the characteristic curve and this will result in a distorted plate current.

The curve of Fig. 1 is called a *static* characteristic curve and gives the plate current which would flow with no load resistor in the plate circuit. In actual operation, however, a tube is operated with a resistor in the plate circuit, and this tends to produce a characteristic curve flatter than in Fig. 1.

As a result, it is often possible to use a slightly larger grid signal voltage, without the distortion becoming excessive, than would be predicted by an examination of the static curve alone. This will be treated further in the following article on power amplifiers, and is not of prime importance at this time.

Voltage Amplification Calculations

Since the readers of these articles are largely those engaged in telephone work, the treatment will be limited to audio and to carrier-frequency amplifiers, and will not include those used in radio.

In the preceding articles, particularly in the second, (TELEPHONY, March 4), the point was repeatedly stressed that the grid has a much greater control on the electron flow than does the plate. That is, if a small alternating voltage, E_g, is impressed between the grid and filament of a tube so arranged that it is operating over the straight part of the curve (Fig. 1) as a linear amplifier, then this voltage will appear as an amplified voltage, μE_g, between the plate and filament. That is, for certain theoretical purposes a vacuum tube amplifier can be regarded as a generator of voltage μE_g and internal impedance r_p as shown in Fig. 2.

In this figure, and in the equations which follow, μ is the amplification factor of the tube; E_g, the alternating signal voltage which is to be amplified, and which is impressed on the grid; r_p is the internal or the alternating plate resistance of the tube; and R_L is the load resistance.

That is, the alternating signal voltage to be amplified is impressed between the grid and filament, and this voltage is increased by the tube and made equivalent to a voltage, μE_g, impressed between the filament and plate. From these statements, Fig. 2 results.

The generator of voltage μE_g will send a current around through the circuit composed of the alternating-current plate resistance, r_p, and the load resistance, R_L, in series. The current is, therefore, $I_p = \mu E_g/(r_p + R_L)$, where I_p is the alternating component of the plate current as shown in Fig. 1.

Part of the amplified voltage, μE_g, will be dropped across the internal resistance, r_p, of the tube, and the remainder across the load resistance, R_L. This latter voltage is the output voltage of the circuit, and equals

$$E_L = I_p R_L = \mu E_g R_L/(r_p + R_L).$$

The voltage amplification of the circuit is E_L/E_g, and is

$$A_v = E_L/E_g = \mu R_L/(r_p + R_L).$$

This value approaches the amplification factor of the tube, but is always less in magnitude.

Resistance-Capacitance Voltage Amplifiers Using Triodes

One stage of amplification is often insufficient, and two or more stages are then used. In such an amplifier, the voltage drop across R_L of Fig. 2

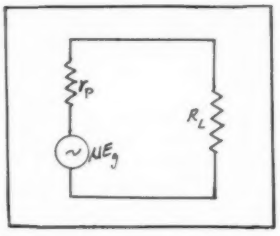

Fig. 2. The vacuum tube as an amplifier acts like a generator of alternating voltage μE_g and internal resistance r_p, working into a load resistance R_L (or Z_L if a pure resistance is not used).

is impressed on the grid circuit of a second tube for further amplification. This voltage is impressed on the second tube through a coupling condenser, C_c of Fig. 3; and from this condenser and the load resistor, R_L, the circuit is called a resistance-capacitance voltage amplifier, or more often just a resistance-coupled amplifier.

The operation of the two-stage amplifier of Fig. 3 is as follows: The alternating signal voltage, E_g, to be amplified is impressed as indicated. Since R_g is very large, say 500,000 ohms, and the grid of the tube is negative, very little current will be supplied by E_g. Since a negligible current flows, negligible voltage drop will occur across the input condenser, C_i, and almost the entire impressed alternating voltage, E_g, will be impressed between the grid and cathode of the first tube.

The purpose of the input condenser, C_i, is to prevent a direct voltage from reaching the grid of the tube if the voltage impressed at E_g contains a direct-current component. Such an undesired direct voltage would incorrectly bias the tube. The condenser, C_i, is often of about 0.05 microfarad. The value of the input resistor, R_i, is often about 500,000 ohms, and its purpose is to impress the desired negative bias voltage, E_c, on the grid of the tube and to act as a volume control. Both C_i and R_i may be omitted in some circuits.

Thus, assuming that the entire alternating signal voltage E_g is impressed between the grid and filament of the first tube, the voltage drop across R_L can be computed as explained in the preceding section and equals

$$E_L = \mu E_g R_L/(r_p + R_L).$$

For a triode having an amplification factor of about 10 and a plate resistance of about 10,000 ohms, R_L would be chosen equal to about 40,000 ohms. The coupling condenser, C_c, of about 0.05 microfarad prevents the plate voltage of the first tube from reaching the grid of the second. The grid resistor (often called a grid leak) of about 500,000 ohms impresses the bias voltage, E_c, on the grid of the second tube.

For the values of C_c and R_g here indicated, their effect from an alternating voltage standpoint can be neglected and the assumption made that all the signal voltage appearing across R_i is impressed on the grid of the second tube.

Using this voltage, and following the theory just discussed, the output voltage E_o can be computed. Or, perhaps a simpler way is to compute the voltage amplification per stage as explained in the preceding section, and to multiply these values of voltage amplification together. This overall amplification multiplied by the input voltage, E_g, will give the output voltage, E_o.

Of course, the frequency response (that is, the amplification at various frequencies) of an amplifier is very important. The response of a resistance-coupled amplifier can be made to be excellent. It is impossible in this article to treat this subject fully, but a few general statements will be made.

The equations which were derived assume that the frequency is high enough—say 1,000 cycles—so that no appreciable voltage drops occur in C_i, C_c, C_o, because some current does acutally flow through them. But for the values of condensers and resistors given, the frequency response will be fairly good from about 50 cycles to perhaps 100,000 cycles. The low-frequency response can be improved by using larger condensers, especially at C_i and C_o.

The coupling condenser, C_c, should be a mica condenser because it must have a very high insulation resistance. This means that its capacitance will be about 0.05 microfarad or less, because mica condensers are limited in capacitance. A paper condenser may be used at C_i if no very high direct voltages are present in the input. The output condenser, C_o, may well be a paper condenser, because it is not connected to the grid circuit.

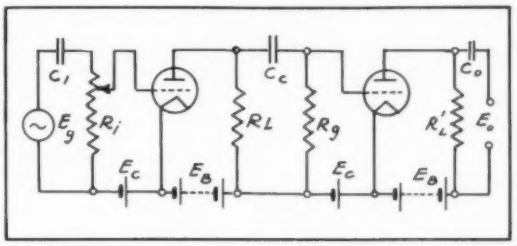

Fig. 3. A two-stage resistance-coupled amplifier. In a practical amplifier, arrangements would be made to reduce the batteries needed.

The value of R_L is usually three to five times the internal resistance of the triode. A few computations will show that although larger resistors will give greater voltage amplification, the drop in direct voltage across these resistors is a limiting factor. That is, the direct-current component of the plate current (Fig. 1) flows through R_L, and this causes a voltage drop which if large is objectionable. To supply a given voltage *to the plate*, the battery or power supply voltage, E_B, must equal the voltage on the plate plus the direct voltage drop across R_L.

Resistance-Coupled Amplifiers Using Tetrodes and Pentodes

A simplified circuit for a tetrode or a pentode as a resistance-capacitance coupled voltage amplifier is shown in Fig. 4. It is at once evident that this circuit is very similar to that of the triode as an amplifier, and that the theory accompanying Fig. 2 will apply. A tetrode is shown in Fig. 4; for a pentode, the suppressor grid would be directly connected (internally or externally) to the filament or cathodes.

As was shown in the third article of this series (TELEPHONY of March 25), although these tubes have very high amplification factors, they also have very high plate resistances. This high resistance is a decided disadvantage, because it may be hundreds of thousands of ohms for the tetrode or screen-grid tube, and over a million ohms for a pentode.

Thus, if a very high load resistor, R_L, *is not* used, most of the amplified voltage, μE_g, will be dropped within the tube; and if a high resistance *is* used, the drop in voltage caused by the direct component of the plate current will be enormous requiring very high direct voltage sources.

For these and other reasons, the load resistors, R_L, are usually lower in value than the plate resistance of the tube, resulting in a large loss in effective amplification, but still giving a greater gain per stage than a triode. And now another factor enters in: Since R_L becomes very large in resistance, it approaches the value of the grid resistor, R_g, and thus the effect of this resistor and the coupling condenser, C_c, no longer can be neglected.

Very little need be said about screen-grid tetrodes because pentodes are so far superior for most purposes that they are rapidly supplanting tetrodes. Thus, data will be given only for pentodes. For a typical pentode having an amplification factor of about 1,500 and a plate resistance of about 1,500,000 ohms, a load resistor of 250,000 ohms, a coupling condenser of 0.005 microfarad and a grid resistor of 500,000 ohms are used. This circuit is rated as having a voltage gain of a little over 100 per stage.

These figures were taken from a vacuum tube manual issued by a radio tube manufacturer. Such a manual can be obtained from almost any radio parts dealer. The gain can be calculated using the method previously explained, but using for the effective load impedance R_L in parallel with R_g and C_c. Data on all common circuits are included in the tube manuals mentioned.

Transformer-Coupled Amplifiers

Transformer-coupled amplifiers offer certain advantages over resistance-coupled types. One advantage is that the load resistor, R_L, need not be used, a transformer primary being inserted in the plate circuit and the secondary used to impress the amplified voltage on the grid of the second tube. Tetrodes and pentodes are not generally used with transformers excepting in radio-frequency circuits. Since these articles are confined to audio and carrier frequencies, only triode transformer-coupled amplifiers will be treated.

A simplified audio-frequency transformer circuit is shown in Fig. 5. The primary of the transformer has low direct-current resistance so that essentially the entire battery is impressed on the plates of the tubes.

A complete analysis of a transformer-coupled amplifier is quite involved, and will not be attempted at this time. Such an analysis can be found in most textbooks treating the subject. Assuming that good audio-frequency transformers are used, it is a simple matter to compute the voltage gain as some intermediate frequency such as 1,000 cycles. At the low frequencies below about 100 cycles, and at high frequencies above about 8,000 cycles, the amplification will fall off.

For best results, audio-frequency interstage transformers such as those shown have a step-up ratio of one primary to three secondary turns. As previously mentioned, this ratio is only completely effective at some intermediate frequency such as 1,000 cycles. *(Please turn to page 34)*

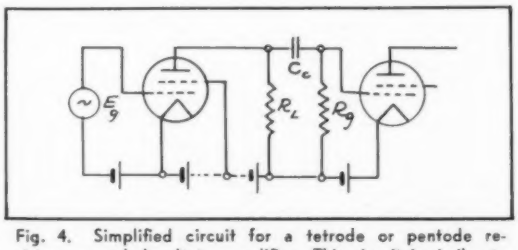

Fig. 4. Simplified circuit for a tetrode or pentode resistance-coupled voltage amplifier. This circuit is similar to that of the triode as an amplifier.

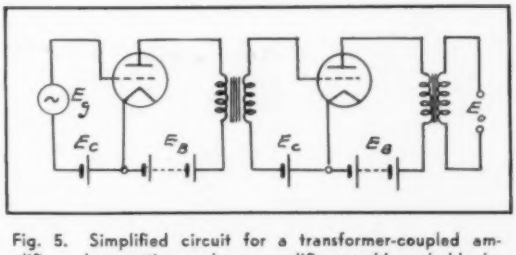

Fig. 5. Simplified circuit for a transformer-coupled amplifier. In practice such an amplifier would probably be operated by rectified a-c power.

INDEPENDENT TELEPHONY'S GREAT ACHIEVEMENT—Amendment of the Federal Wage-Hour Law definitely exempting small telephone exchanges from provisions of the Act. Reproduction of the bill as passed by Congress, signed by presiding officers of the House and Senate, and legalized as law by President Roosevelt's signature. The original engrossed copy will be filed in the archives of the Department of State. This was the only Wage-Hour Act amendment passed by Congress.

[PUBLIC—NO. 344]
[CHAPTER 605]

S. 1234

THE WHITE HOUSE AUG -4 1939 RECEIVED

DIVISION OF PROTOCOL AUG 10 1939 DEPARTMENT OF STATE

Seventy-sixth Congress of the United States of America;

At the First Session

Begun and held at the City of Washington on Tuesday, the third day of January, one thousand nine hundred and thirty-nine

AN ACT

To amend section 13 (a) of the Act approved June 25, 1938 (52 Stat. 1069), entitled "Fair Labor Standards Act of 1938".

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 13 (a) of the Act approved June 25, 1938 (52 Stat. 1069), entitled the "Fair Labor Standards Act of 1938", be, and the same is hereby, amended by adding a new subsection 11 as follows: "or (11) any switchboard operator employed in a public telephone exchange which has less than five hundred stations".

Wm. B. Bankhead
Speaker of the House of Representatives.

John N. Garner
Vice President of the United States and President of the Senate.

Approved
Aug 6 1939
Franklin D Roosevelt

Now Let's Go!

FOR MORE than eight months thousands of small Independent telephone exchanges in this country, their employes and their patrons, were under the blighting shadow of the federal Wage-Hour Act. It was from the day, early last December, when the wage and hour division in Washington held that telephone exchanges were not exempt from the law as "service establishments," to the evening of August 9, 1939, when President Roosevelt signed and made into law the Herring bill exempting from the law switchboard operators in public telephone exchanges having less than 500 stations.

Thanks to the energy and persistence of Independent telephone people, led by the special wage and hour committee of the United States Independent Telephone Association, and ably assisted by state telephone associations, the law has been definitely amended with respect to at least a considerable number of small telephone exchanges.

The law was, in fact, probably never intended to cover telephone exchanges, which must ordinarily supply service all 24 hours of each day and which are under regulation as to their charges for service and also in other ways. Until early last December it was assumed that most telephone exchanges were exempt from the law by virtue of the provision exempting "service establishments" when the greater part of their "selling or servicing" is intrastate.

The legal staff of the wage and hour division of the Department of Labor, however, decided otherwise, and it became apparent that the only definite way of fixing the status of many small exchanges without expensive and long-continuing litigation was an amendment to the Act.

The United States Independent Telephone Association has never agreed that the exemption obtained by the amendment is adequate, nor has it relinquished its contention that telephone exchanges should be generally exempted as "service establishments." However, the industry at least knows now where it stands with respect to a considerable majority of Independent exchanges, and plans for the future can be based on that.

There undoubtedly will be a number of "border line" cases of Independent exchanges with more than 500 stations which will have difficulty living under the law, especially when, on October 24 of this year, a still higher minimum wage per hour and shorter maximum hours become effective. These cases will occur mostly in exchanges having from 500 to 1,000 stations.

As to those cases, the national association believes each will probably have to be dealt with on its own merits. Administrator Elmer F. Andrews of the wage and hour division of the Department of Labor, who has shown a sympathetic understanding all along of the situation of the Independent companies, will no doubt be willing to give careful consideration to every Independent telephone exchange which, because of some reason beyond ordinary management control, cannot meet the requirements of the law.

The United States Independent Telephone Association has offered its services to all exchanges which feel that they need special consideration, and it will make such study and presentation of their difficulties as the situation requires.

The whole position of the Independent telephone industry with respect to the federal Wage-Hour law is, therefore, clarified by the exemption provided for in the amendment. The stagnation that has to some extent been brought about in the industry because of the uncertainty of its position under the law, should now cease.

IT WAS only natural, of course, that during these months of uncertainty, many exchanges were unwilling or unable to go forward with plans for extending, rehabilitating or improving plants, and with other plans upon which they would have been progressing had this uncertainty not existed. Naturally, few managements, particularly of the smaller exchanges, could think or act rationally about expenditures on plant or otherwise when there was a probability at the time that their operating expenses would exceed their income within a few months.

But the policy of the industry should now be: "Let's go!"

This policy should extend to management and managerial practices as well as to extension and rehabilitation of plant and property.

Rates for service are, after all, a matter of management; that is, unless management is willing and able to properly and intelligently present its case for needed rate adjustments, such needed rates are not going to be obtained.

Where higher rates are needed to allow an exchange to comply with the Wage-Hour law—and this applies particularly, of course, to the "border line" cases mentioned in the foregoing—it is up to the management of those exchanges now to go after those rates. It is management's business to present its situation fairly and squarely to both the proper regulatory body and the public, and to obtain the necessary additional revenue.

This needs to be done at once, because under the Wage-Hour law higher minimum wages per hour and lower maximum working hours become effective October 24.

As to needed extensions of plant, rehabilitation and improvement of plant, and all the other things telephone exchanges would in ordinary course be doing—so many of which have been delayed because of the uncertainty of the wage and hour situation—the answer to that is "Let's go!"

THE TELEPHONE industry has always been forward-looking and progressive. It has never been blocked for long by anything—even the Great Depression did not destroy the courage and progressiveness of telephone people! With the doubts and uncertainties of the wage and hour situation now clarified, plus the reasonable assurance now existing that special cases deserving it will receive special attention, the progressive telephone organization now has a green light and a clear track ahead.

It is to the credit of telephone people that never, even when the chance of obtaining relief from the federal Wage-Hour law looked darkest, did they propose or sponsor any measure that might, if successful, have destroyed the Wage-Hour Act and the principle of the best possible wages for employes. It is to the credit of the industry that it has always favored liberal wages, fair working hours and the best possible working conditions for all employes of telephone companies.

It is also to the credit of the Independent industry that a principal concern of its leaders in the Wage-Hour Act amendment work was that failure to obtain such an amendment would have meant the loss of many jobs by faithful and loyal telephone employes.

The dark cloud of the Wage-Hour Act has rolled away for a majority of the Independent exchanges where the welfare of the business and its employes and the quality of service rendered its patrons were imperiled—or it is fairer, in proper recognition of the valiant work of the special wage and hour committee of the United States Independent Telephone Association to say that the cloud has been pushed away. Now, let's go!

In the Nation's Capital

by Francis X. Welch

Special Washington, D. C., Correspondent for TELEPHONY

***REGULATION** of utilities has become "Big Business" within last two decades. . . . Spending of 25 million dollars a year for federal and state regulatory agencies makes professional utility regulation one of nation's leading specialized industries. . . . Taxpayer must watch regulation to keep it within reasonable limits just as commissions watch utilities to assure reasonable rates and service*

NOW THAT the pressure of official business has slackened, we have an opportunity to consider the matter of bureaucracy, particularly regulatory bureaucracy. Few people, even in utility circles, seem to realize that regulation of utilities in the United States has become "Big Business" just within the last two decades.

The bill presented to the taxpayers for regulation of public utilities alone in this country amounts to around 25 million dollars a year, of which about 15 millions are spent for regulatory agencies of the federal government (FCC, SEC, FPC, and ICC). The balance is spent throughout the states on public service commissions and similar regulatory bodies. Twenty-five million dollars a year is a lot of money in any line. It makes professional utility regulation one of our leading specialized industries.

And that's not all. For every dollar spent by the federal government on regulation, the utilities must spend at least as much, if not more, complying with that regulation. A power utility executive said not long ago that every time the FPC hired another man to "ask my company questions, I have to hire three more fellows to answer them." That is probably a humorous exaggeration, but it gives one an idea of the way regulatory expense continues to grow upon its own growth.

At one time during the recent special telephone investigation of the FCC, it was unofficially estimated that the investigation was costing the Bell organization about twice as much as it was costing the FCC. And the bill for that particular special job ran around $1,500,000. Needless to say, these utility expenses must be passed along to utility customers by way of charges against operating expenses.

Now we all recognize at once that utility regulation is necessary in this country. No one would seriously argue at this late date that a business so intimately charged with public interest should be left to govern itself entirely. The only alternative we have to regulation with its incidental expenses is government ownership. So far the American public has preferred private operation under government regulation, with results which, on the whole, have proved relatively satisfactory.

YES, IT IS quite easy to make out a case for the proposition that regulation is well worth its keep in terms of rate reductions and in terms of better service. Trouble is, one can also make out a pretty good

case in the other direction as well. For instance, take the line of reasoning pursued by the FCC in its final report on the special telephone investigation.

Here the commission sought to justify the special congressional appropriation of $1,500,000 by pointing to telephone rate reductions aggregating more than $30,000,000, "directly resulting from the investigation." Stated that way, it seems like a splendid return on the taxpayers' investment, and it must be conceded right off the bat that there is some basis for the claim.

On the other hand, consider the case of Delaware. The state of Delaware is the only state in the union that does not have a regulatory commission of some kind. Some of the other states have inactive commissions and commissions with greatly limited jurisdiction (Texas and Iowa do not regulate telephones); but Delaware is the only state that doesn't spend a penny on utility regulation; never did, and apparently has no intention of doing so in the future.

Yet the rates for gas, electric, and telephone service are not notoriously high, nor is service inadequate. In fact, both utility rates and utility service in Delaware are pretty much in line with the standards prevailing in the neighboring state of Maryland, which has long had one of the most active and able public service commissions in the country.

There is the case for both sides: More regulation and less regulation. As usual, the truth lies somewhere in the middle. There is obvious fallacy in both the claim of the FCC and the suggested conclusion from the Delaware experience.

First of all, the FCC claim implies that none of the telephone reductions would have been made if the investigation had not taken place—an entirely unwarranted assumption. The Bell System has made periodic downward revisions of its rates in the past, before the FCC was created. It would doubtless have continued to do so even if the FCC had never come into existence. Whether these recent rate cuts were hurried along by FCC pressure is a fairer way to put the question. Probably they were. Even so, the state commissions were helping along with regulatory pressure, as well as the FCC.

In the Delaware situation we have a condition known as "regulation by attraction," which is a more or less psychological regulation. It is because of the very fact that the utility rates in Maryland, Pennsylvania, New York, and New Jersey and elsewhere have been brought down to a comparable level that Delaware utilities would not dare to boost rates conspicuously out of line, and thereby invite political reprisal.

In other words, the people of Delaware are enjoying, scott free, an atmosphere of regulatory discipline which has been brought about by the regulatory efforts (and expense) of her sister states. It's smart for Delaware, perhaps, but it would hardly be a general solution of the regulatory problem simply to throw the whole system overboard and rely upon the enlightenment and self-restraint of every utility company in America to behave itself.

WELL, WHAT is the answer? Unfortunately, there is no hard and fast rule for determining just how much regulation ought to be necessary and at what expense to protect the public and yet deal fairly with the utilities. Some states spend very little on regulation and get pretty fair results — thanks to cooperative local utilities and to situations similar to the Delaware case mentioned. In other circumstances, states have spent very much and reaped a crop of futile litigation—thanks to overzealous officials, contentious utilities, or a combination of both.

Here in the nation's capital, for example, there is a very active public utility commission, which has succeeded in bringing about one of the lowest general civic utility rate levels in the country on an annual appropriation of less than $75,000. Of course, this is because of special local conditions, chiefly the so-called "Washington plan," whereby rates of the gas and electric utility companies are regulated almost automatically. All the commission has to do is to stand by and oil the machinery once in a while.

But what your correspondent started out to suggest was that there ought to be some criterion, some test, or some formula for determining how much should be spent for regulation. Otherwise, regulatory commissions have a tendency to run wild, and the public will have to foot the bill—as usual.

BUREAUCRACY is a mean name, when you stop to think that it is only a human trait and simply a manifestation of ambition. Any man worth his salt likes to do his job well. And when it is a continuous job, he is constantly thinking of ways to improve it, refine it, make it more important.

And it isn't always a case of a politically-minded group trying to invent new ways to make more jobs and increase its own prestige and influence, although that factor doubtless enters into the situation. No, bureaucracy is often simply the result of able and well-meaning officials losing themselves in their work and of also losing their sense of proportion. It suggests the little boy who became so interested in swatting houseflies that when he had killed all in the house he opened the screens to let in a fresh supply.

Viewed in this light, bureaucracy in government is essentially the same human quality as initiative in private enterprise. The difference is that in private enterprise, it is a commendable and profitable thing to seek constantly the expansion of one's commercial operations. In government, which is necessarily conducted at public expense rather than for profit, this very Napoleonic tendency can become a headache to the taxpayer and a veritable nuisance to private industry.

Coming back now to the federal commissions, we see a challenging growth within the last decade, and especially since the advent of the New Deal. Of course, conceding that regulation is necessary in the beginning, it is only natural to expect that it will expand and become more expensive as the utility industries themselves expand their operations. But the rate of growth of the federal commissions during the last few years has so far outstripped any corresponding expansion of utility activity, that there is a serious question of whether it is altogether necessary. For, just as it is possible to have too little regulation, it is also possible to have too much of it.

Last week the United States Civil Service released figures showing that employment in the executive branch of the federal government had reached a new high mark of 925,260 in June, an increase of 7,436 in the past year. Remember, that is for all federal bureaus and departments—showing that bureaucratic growth is not confined to the regulatory commissions by any means.

In the regulatory commissions, we find that during the last year employment in the SEC has increased from 1,214 to 1,576; in the Interstate Commerce Commission, from 2,430 to 2,621; in the Federal Power Commission, from 461 to 721.

The Federal Communications Com-

mission shows a decrease of from 623 to 616; but when we recall that this is only a reflection of the dismissal of the staff for the special telephone investigation, now completed, which at one time had a personnel of 304, we will see that even the FCC has had a pick-up in its regular personnel. Even at that, the FCC would have added 86 more employes this coming year if Congress had not taken its economy ax to the proposed supplemental appropriation of $210,000 for regulation of the telephone industry.

There are doubtless explanations for these increases. The ICC, for example, has only recently taken over the task of regulating the motor industry; the FPC, which shows the biggest proportionate increase of all, has had to take the natural gas industry under its wing; and the SEC is continually finding its work more complicated.

Yet, only a few years ago, the FCC was not in existence. The old Radio Commission got along on a little more than half a million dollars a year. We read in the 13th annual report of the FPC (1933) that "the total cost of administering the act from June, 1920, to June, 1933, was $2,583,848.27."

REFORMERS will urge, with some justification, that this large increase in regulatory expense simply represents a long overdue lag in the various lines of utility control, which are now imposed by law but were not before the days of the New Deal. They will argue that we should have had more vigorous and more expensive federal regulation years ago; and that only now is the federal government catching up with duties which it should perform in the public interest.

However, if we were to superimpose upon a chart representing the growth of utility investment since 1907 (the practical birth-year of commission regulation in this country) a line representing the growth in regulatory expense, particularly federal regulatory expense, we would see a steady rise in all forms of utility operations, with the possible exception of electric railways.

In the case of electric power and, to a lesser extent, telephone, this rise would become accelerated from 1922 on. But in the case of regulatory expense, the rise would be very modest all the way through the year 1932; and then it would shoot up like a skyrocket. Oddly enough, it was during this very period that the utility lines levelled off, and even dropped to some extent for a few of the depression years.

Now the moral, if any, of this discussion is that the taxpayer has to keep a weather eye on regulation to keep it from getting out of hand, just as the regulatory commissions have to keep an eye on the utilities to keep them from getting out of hand.

One approach might be to establish some sort of a reasonable relationship between utility revenues and the amount of regulatory expense involved in their control. If, for example, a certain state commission can do a good job of regulating utilities by the expenditure of only $1 for every $500 in utility gross revenues, that might be taken as a sort of a yardstick. Possibly some similar criterion could be devised to measure the cost of federal commissions.

But certainly, if utilities are taking in no more this year than they did last year or the year before that, the fact that regulatory expense tends to double itself or treble itself within the same period raises a serious question of whether somebody, with the best intentions in the world, perhaps, is not trying to make a more important job for himself.

EVERY telephone man, big and little, knows right now that the growth of paper work connected with regulation is approaching one of the major problems of business. Furthermore, it appears to be one of those problems which some seem to think ought to be soft-pedaled. Certainly, as soon as anyone starts to complain about the excessive cost of regulation, he is promptly labeled by the left wing as a reactionary of the most absurdly obsolete type.

Yet government red tape, which has its necessary corollary in business red tape, has not always demonstrated its economic justification. Probably the greatest example of this is the railroads which have had hundreds of millions of dollars siphoned from their already precarious reserves for the preparation of ICC statistics. For instance, there is the program of railroad valuation which the ICC has been carrying out under a bill insisted upon by the late Senator La Follette, Sr. These expensive figures have usually turned out to be practically useless by the time they were completed for the various railroads.

Only recently the FCC adopted a rule requiring every broadcasting station in the country to keep a detailed log of programs. This will make work and expense at the FCC and in the radio studios where somebody will have to make an entry every three minutes or so for every phonograph recording, etc. A certain amount of FCC knowledge about the general characteristics of radio program content is, of course, an essential part of its regulatory task. But it is hard to see what burning need there is for the FCC to know whether the folks down at Fleabite Gulch at 1 p. m. on September 5 were listening to a swing band or a plug for liver pills.

Over a year ago a paper was presented at one of the electric association conventions by an accountant of the Consolidated Edison System of New York, B. S. Rodey, Jr., who said: "The pendulum here has swung so far that one might think we have carried accounting for construction costs, inventory, retirements, and depreciation to a point where accounting seems to become an end in itself."

As a result of these trends accounting costs to the electric industry, according to Mr. Rodey's 1938 figures, have increased 30 per cent per customer in 30 years from an average of $2.70 per customer to $3.50 per customer per year. During the same 30 years, production costs in the electric industry have been cut 50 per cent.

In other words, in terms of production cost, accounting costs have increased 250 per cent in two decades. This is undoubtedly the result of regulatory zeal. Hardly any material change can be made in the physical plant of the modern large utility without a corresponding authorization of debits and credits to plant investment accounts.

But the cost of the paper work alone involved approaches a substantial portion of the cost of the actual physical change. After all, the purpose of regulation is to make good utility service available to more people at cheaper rates. Utility technicians are constantly making progress towards this end, but if the offsetting red tape expense keeps mounting, it is going to be an increasingly uphill task to perform.

The point to keep in mind is that regulation should always be in the public interest and never an end in itself. When the expense of regulation exceeds its resulting over-all economy, that is the point where true regulation ends and bureaucracy begins.

***LONG BEFORE** management realizes some part of a supposedly perfect service is displeasing, the operator is aware of customer reaction and is in a position to give helpful tips on the causes of sour notes. The operator is the spirit which moves the telephone machine and her influence should not be undervalued. Address given before convention of the North Dakota Telephone Association discusses*

Telephone Service

From the Operator's Viewpoint

By STUART H. KELLEY
Traffic Supervisor, Northwestern Bell Telephone Co., Fargo, N. D.

A VIEW of telephone service depends, in some measure, for its accuracy upon where you stand to look at it. Telephone service is a good deal like the old parable we have so often heard about the three blind men who were invited to inspect and describe an elephant. The first, it is recalled, took hold of the tail and said, "An elephant is like a rope." The second seized a leg and said, "It is like a tree," and the third felt of the elephant's flank and said, "You fools, an elephant is like a wall." And so with telephone service, in its many-sided aspects to the beholder.

First, the customer wants his service to put his calls through. He does not inquire about the mechanical process involved, nor the methods, nor the people as they affect a particular call. To obtain his view we telephone folks probably must relate it to our own view of, say, mail service. We mail a letter and await the reply. We do not wonder about who picks up the letter, how it is routed, what the railway mail clerk does with it nor how it gets to the postman who puts it in the mail box at the other end.

If the whole mail chain does not work without fail, we are vastly irritated and displeased with our federal government and all of its employes. We are not in the least inclined to sit down and polish up our own handwriting in an effort to give the post office a better break.

Secondly, the manager of any telephone plant wants the service to be pleasing, accurate and speedy because he knows these virtues will retain the business he now has and will attract more business. Thus, his institution will measure up to the vital importance it holds in the scheme of the life and the industry of today.

The operator's view is a valuable one to management, believes STUART H. KELLEY, Fargo, N. D., traffic supervisor of Northwestern Bell Telephone Co. She is in a strategic position to learn the attitude of subscribers and whether they disapprove of any company practices or policies.

Now we approach the third view of service, that of the operator. To her, wherever she may be—in city, town or village—come all the purchasers of the merchandise we have to sell and to them she delivers the goods. She is *the spirit* that moves the machine. Upon her ability, zeal and knowledge depend the class of product which the customer will receive from our factory.

Few indeed are the analogies or similar situations in other industries which parallel this circumstance in our business. It is as though the great farm-implement industry set up a smelter and a forge in every town, then hired an employe and said to him: "Here are your instructions and blue prints and here is a supply of raw material. We'll drum up the business for you. Now go to it and fill the orders."

It seems as though that employe's view of the implement industry would be far-reaching and one of the most important views that could exist.

And so it is with the operator in our work. Thus, it is one of the most important features of management activity to insure that we are providing the soundest foundation for each operator to build upon in working out her idea and ideals of the job.

Ethics in Telephone Operating

Each of you has been provided with a copy of an article reprinted from the April 1 issue of TELEPHONY which that magazine has cordially invited us to use here. That article is a story of "Ethics in Telephone Operating" as an operator tells it and is a particularly intimate and human picture of the high standards which shortly become a part of the daily business life of every girl at a switchboard. Most of you have read its message before but it is worth reading again. Pass it on to your employes as a standing tribute to their professional importance in our business and in every business and home of today.

The article deals with service as it

CONSTRUCTION MATRI

Our Four Well-Stocked Warehouses Cater Exclusively to Telephone Companies — Supplemented by 70 Shipping Points for Specific Products!

Fast, complete service to operating companies is provided by our four warehouses strategically located as shown on the accompanying map. Manned by trained telephone men, these are exclusively telephone supply warehouses, established specifically to serve the telephone field. Here you will find not only complete stocks of all telephone supplies and materials, but also careful, intelligent attention to every detail of your order.

Supplementing our own four well-stocked warehouses, are 70 shipping points for specific products—such as poles, pole line hardware, crossarms, insulators, line wire, etc. These are maintained by nationally known manufacturers of well known products that we handle, and consist of their own factory stocks and branch warehouses—from which points shipments of individual items can often be advantageously made.

In all cases, you order from a single source—saving in effort and time, and saving in bookkeeping expense. You benefit in other ways, too. In materials of Automatic's manufacture, you get Automatic Electric quality. In nationally known goods of other makes which we handle, you get Automatic Electric's guarantee of similar high quality. You are also assured of getting materials specifically designed for telephone use, at rock bottom prices. Won't you try us on your next order?

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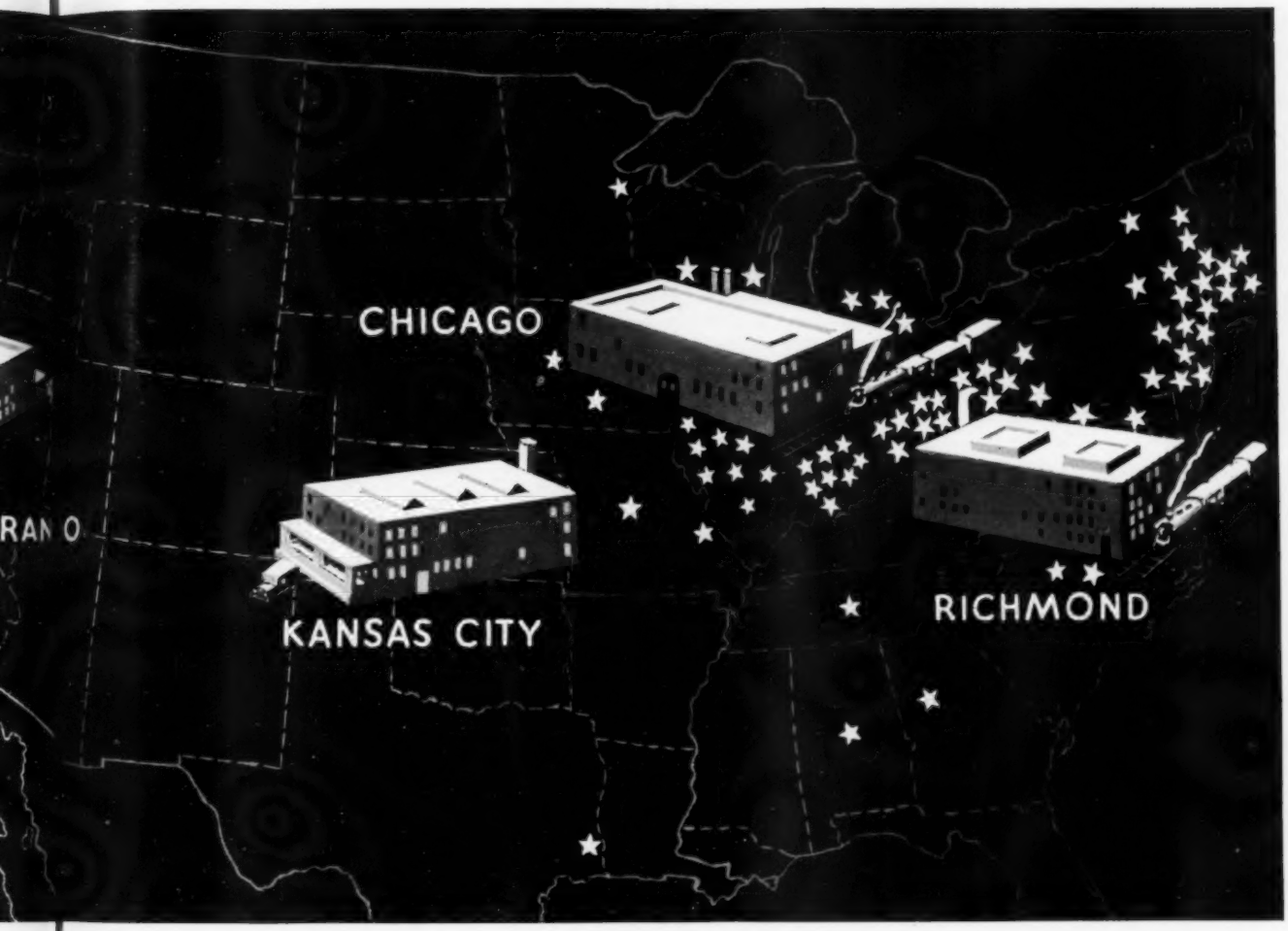

rs ind factory stocks and branch warehouses from which various individual items can sometimes be ously . These include nationally-known high quality brands which we handle, such as Black Beauty and lquitt Whitall Tatum and Hemingray insulators, Hubbard and Oliver pole line hardware, Klein pliers and ts, Coeld drop wire, Standard Underground cable, Nicopress tools and sleeves, etc.

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reaches the customer, telling how each call has significance in itself and in relation to other calls. It points out that each customer's wants have equal significance to the needs of every other customer. It pictures the security afforded to telephone users in the secrecy of their communications.

The story is told of the friendly spirit among the girls in central offices and of the high esteem in which telephone work is held in the minds of applicants for employment and of the public at large. It relates how the ideals and motives of giving speedy, accurate and personal service to customers grow to be a guiding impulse in the mind of the operator.

Looking at the responsibility of management toward the operator, the switchboard work may be divided conveniently into four phases—personnel, tools, practices and results. These features will now be considered in a brief and general way for the purposes of this limited discussion.

The personnel, as it contemplates the individual operator, is dependent initially upon the type of applicants that the work can attract and then upon the proper selection of employes from these applicants. Every individual has the capacity for giving a good, sound service performance if she is properly-equipped for the job.

Some applicants will stand out as being preferable, possibly because of their personal knowledge of local business and people. They will thus be able to assist in completing the more difficult calls within the exchange limits and those going out from local firms or coming in from the outside. A favorable attribute for an operator is a friendly and alert nature which translates itself readily into a real and personal interest in attention to the service needs of customers.

Curiously enough, while all operators deal with a complex kind of equipment there seems to be no relation between a liking for mechanical contrivances and a good operating job. On the other hand, there is a real value in manual adeptness or speedy coordination between hand and eye. This may be ascribed to the fact that if the manual effort can shortly become a natural habit, then the attention of the individual can be focused entirely upon the personal or human part of producing the service.

Following selection of the applicant the problem of effective training comes into the picture. In this connection, it is a happy circumstance indeed that the leaders of the teaching profession today emphatically tell us the best way to learn is the good old way that has most generally been used in smaller telephone offices since the beginning of the industry; that is, to learn by doing.

Thus, it is found there is no value in providing a student operator with a textbook two inches thick and having her read herself into hysterical confusion about all the complexities of the telephone business. Instead she is briefly told some of the basic facts about the work, how to answer and complete a simple local call by number. She is invited to sit at the switchboard where, in company with other operators, she finds herself not just watching but actually doing the first and easier tasks of operating. Before she has time or occasion to get stage-struck or buck fever, she is an operator.

The remainder of her training is chiefly a matter of learning how best to handle the more difficult situations as they arise. This natural way of learning tends to reduce to a minimum the tendency for a student operator to get lost in the mechanical part of her work with keys and cords to the point where the call itself loses its personal aspect. Use of phrases and use of equipment should be regarded separately in order that each may be significant in itself.

Even the more involved problem of handling long distance calls is taught in the same way as local operating, and it is now considered best to teach an operator how to record a ticket after she knows how to operate on a toll call rather than before. By moving easily and naturally through such a process of *learning by doing* it is found that the operator gains in proficiency as much off the job as on it.

Everyone can recall how he learned to skate or ride a bicycle after falling about for a day or so with no apparent progress and starting out the next day to find that a miracle had happened overnight and he could now keep up with the crowd. Every telephone manager has often found the best of his operators to be those who grew up in the central office and learned to operate before they could reach high enough to restore a ring-off drop.

Pleasant Surroundings, Good Equipment Important

The tools we provide for an operator are such things as her switchboard and its associated equipment and surroundings. It is essential that the switchboard be located in surroundings as light and pleasant as possible. Nobody would expect a canary bird to sing in a coal scuttle. Comfortable operator's chairs should be regarded as of far more importance in the scheme of things than a comfortable office chair for the managing head of the company.

Finally, with respect to the switchboard, it has been found to be true time after time that the operator will work—and work hard — with whatever equipment she is given. Instead of questioning its performance or its adequacy she likes to carry on. This is generally a splendid virtue but needs to be tempered by some continuing assurance to the operator that management wants its equipment to be operating as capably as it is designed to.

If the operator does not have that assurance customer service quality is threatened, and some day it will be necessary to reckon with serious customer reactions that could have been averted easily had the operator been encouraged to keep management informed of all she knew about the business.

Methods and Practices in Telephone Development

And now comes the subject of methods and practices. This is a continually - developing problem which must keep step with an industry that never stands still. So far as we know, operating phrases have but two purposes: First, they serve as a sort of spoken shorthand; that is, they say briefly, correctly and politely what must frequently be said. Second, they serve as a common denominator of language or a universal tongue, clear and intelligible, that marks no difference between Alabama with its "fetch," "thataway," "you-all" and "we-uns," and Ver-

A Zest for Living Flows from Within

People who do things in this world and who get joy out of them have a philosophy which flows from large selves, from loyalty to causes, from interest in others, from loyalty to enterprises and organizations of which one is a part, from a satisfaction which comes from seeing these groups grow stronger and wider in their influence.—DR. GEORGE EDGAR VINCENT, before The Executives' Club of Chicago.

ment with its Yankee twang so far as concerns the understanding of the operator or customer in North Dakota.

The factor of universality is an aid to that feature of our business which is more important than ever before: that is, *courtesy between operators* working at distant ends of the same connection since today the customer is generally among those present and naturally reacts favorably to a pleasant and agreeable operating performance.

Nothing is more valuable to the communication industry than a sound and comprehensive, yet simple and understandable, body of reasonably uniform practices. On the other hand those practices may be abused as easily as they may be used. To use a set phrase to the point of monotony, or in a way that indicates that the words have long ago lost their meaning and value, is a serious operating fault.

Everyone has occasionally heard with a little shock of distaste an operator repeating "Num Plis?" "Nuh Plis?" for "Number, please?" or heard a tin-panny, toneless "One moment plis" or a mechanical "Excuse it plis." Yet these are faults due not to the practices themseives but to the use made of them.

Take Impersonality Out of Standard Phrases

A great task of management today is to take the impersonality out of phrases, to teach operating forces when not to use set phrases as well as when and how to use them. The operator should know we all realize that oftentimes the best service can only be given by departing from the customary phrases.

In other words, the problem is how to help the good metropolitan operator to do as high-class an operating job as everyone knows the good small-town operator is able to do all the time because of her intimate knowledge of the customers she deals with and her consequent ability to fit the treatment of each call to the needs of the service-user.

Finally, there is the proof of the pudding—the results. Here again the operator's view is a most valuable one to management. The operator is well aware of the temper of the customer body, whether it is bad and unfavorable, or complacent and passive, or is actively pleased and favorable. She often knows which practices and which policies are striking a sour note to the customer and which of our tools is not functioning efficiently long before a customer reaction is apparent to management.

The alert operator has a more intimate knowledge of customer attitude toward the business in all respects than nearly anyone else. With proper encouragement she is delighted to pass this information on to those who are responsible for weighing the value and significance of the policy, practice or equipment in question so that appropriate changes may be made and proper interviews may be had with customers when required.

The final measure of good results rests wholly with the customer. By means of a friendly institution, well-operated, with reasonable charges and a sound program for keeping the customer informed about the industry, there need be no fear of slipping backward. Yet to be assured of going ahead and attracting new business the actual results attending the local and toll service—how fast, how accurate, how effective it is—must be noticed, and noticed positively, by the customer. He must feel that here is something that is good, that occupies a place for itself and stands out as a service that is not only indispensable but so attractive that he wants more of it.

That is the impression the operator alone can give. And she can do one more thing—she can often tip off the management that Mr. Customer is ready to buy some more service if someone will just go out and sign him up.

All these things, and more, the operator will do most gladly but she will do them more effectively if the boss will sit down and talk with her occasionally, giving her cordial credit for the job she does, inspiring her with the service ideals of this industry, informing her of the reasons for those features of the business which are not clear to her; and, most important, by attentive interest in her suggestions, indicating how important her view of the work is to the advancement of the business.

Finally, by such friendly understanding within the office a closer approach will be made to that principle of human behavior in which the telephone industry may truly be considered a great leader today; namely, the idea that all of us—boss, employe, customer and fellow-worker in the business—are neighbors and friends, together on this planet for a rather brief time, owing everything we have to one another, and now is the time to fulfill the mutual obligation as we go about the work from day to day.

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NEW IDEAS AND SHORTCUTS

for Plant and Exchange

By RAY BLAIN

WHAT is your "pet kink" or best method of doing a certain job? Why not tell others through this new department?

The Truck Ladder Arrangement

In ordinary exchange construction and maintenance work a lineman sometimes finds that he must get up into the air and move quickly from place to place. This proves true on such work as covering an aerial cable, replacing rings which have slipped or when looking for cable trouble. The work can, of course, be performed from a cable car, although it is a slow and somewhat difficult task.

Trucks may now be obtained with a ladder and platform which can be raised and adjusted to practically any angle. Such a truck with its handy arrangement would no doubt prove a good investment for many of the larger companies. However, it is still outside the hopes of many smaller companies, which from necessity must devise some local arrangement.

We have recently found that it is a comparatively simple task to lash a good, strong, extension ladder, in an upright position in the rear of our construction truck. The ladder may be quickly adjusted up and down and will easily support a man, even with the truck in slow motion. This arrangement has proved most useful on certain types of work. It costs very little to try the arrangement and telephone companies should find it extremely useful. Undoubtedly special clamps could be devised to hold the ladder firmly in place without lashing.

A strong extension ladder, lashed in an upright position in the rear of a construction truck, permits a lineman to work from its top.

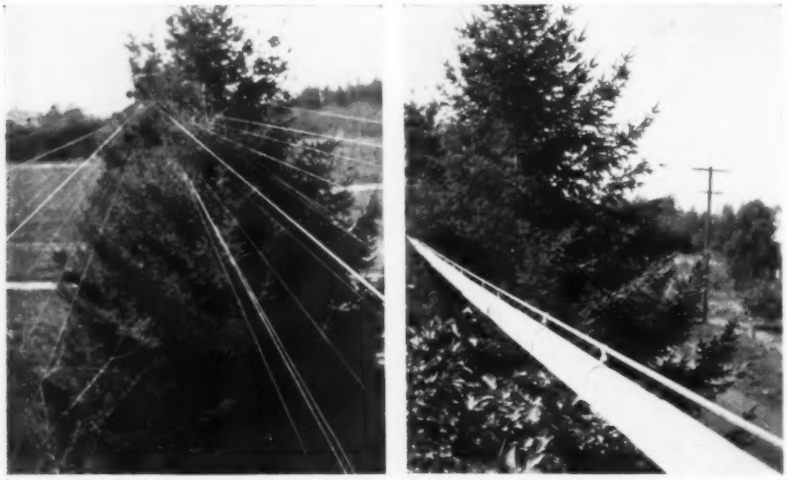
Trees and Telephone Distribution Systems

Trees and telephone wires are becoming more and more a problem with telephone companies. Highway beautification is resulting in more trees along highways and tree-trimming is an increasing job. A practical method of satisfactorily carrying open wires and cable through trees with a minimum of trimming has been developed and is being successfully used by utility companies in Oregon and Washington.

Developed by an Independent telephone man of many years' experience, an overhanging metal shield with proper holder rings for supporting aerial wires and cables is the principal feature of the method. The shield makes a practical substitute for cable in small exchanges when used with bridle or other suitable insulated wire.

The metal shield—called the "Short Shield" after its inventor, L. W. Short, Beaverton, Ore.—is supplied in sections of convenient length with an arrangement which automatically locks the sections together as they are installed. Holder rings which support the insulated wires or cable inside the shield also serve to attach the shield to messenger strand through the trees. The illustrations show before and after views of open wires through dense foliage.

When the shield is used in small exchanges in connection with insulated wire for distribution purposes in place



"Before and after" views of an open-wire lead passing through trees having dense foliage. Bare wires were replaced with insulated wires and then placed in a "shield" suspended from messenger strand, the same hangers also supporting the wires inside the shield which is open on the under side.

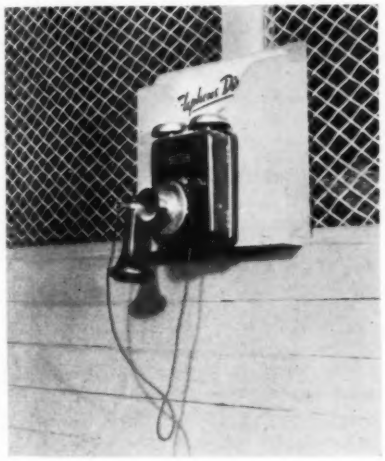
of cable, a number of advantages are claimed for it in the matter of first cost, installation and maintenance. It is believed that a properly constructed system of this kind would eliminate 90 per cent of the common trouble inherent in the conventional types of aerial distributing plants.

In cases of the use of the shield in trees the wires are shielded from ordinary chafing and are protected against the elements at all times. As there is no drastic trimming or mutilation of trees, good public relations are built and money saved at the same time.

▼ ▼

Directory Boxes Dress Up Wall Telephones

Many companies have numerous good wall-type telephones in their storerooms and are unable to make use of them in any way. Most subscribers would like handsets—few will be satisfied with desk stands and practically none will accept the old-style wall sets. This is true, although in many locations the wall set will provide service superior to any other type of set.



When the wall type telephone is installed on a shallow box, which serves as a directory holder, it presents a neat appearance and appeals to subscribers.

When we are certain that a particular thing is good for our subscribers, we do not believe that it is out of order to resort to a little "window dressing" in educating them to the point of liking it. With this in mind we constructed some shallow boxes, just large enough to accommodate our telephone directories, and on them mounted wall telephones. This arrangement, which keeps the directory close at hand and protected at all times, appeals to most subscribers. Our boxes are well made, and well finished and present a most attractive appearance.

Suggested locations for this type of instrument are: garages, machine shops, filling stations and engine rooms. We have not had a single complaint from any of these instruments and have many of them in service.

Best Story of the Week — What's Yours?

Out in the tall corn state of Iowa in the early days of the telephone it was common practice, and considered necessary, to unhook the line wire from the house during a storm to avoid sudden death from lightning. The wire was generally quite slack and an ordinary harness snap was used with a metal ring to make the connection. Naturally this did not tend to improve transmission which was an unknown quantity in those days anyway.

"Early one morning after a severe thunderstorm," writes Ray Blain, "a certain farmer went out in his old-fashioned night shirt to connect the line so that he could call a neighbor concerning some special work of the day. He grasped both ends of the wire in his hands preparatory to connecting them. At that exact moment another party on the line made a call, sending out the ringing current with the full force of a five-bar hand generator.

"Our farmer friend was unable to let go of the line wire and, it is stated on good authority, that he gave a good imitation of that mythical knight errant and indefatigable fighter of windmills, Don Quixote, with suitable sound effects. The old chap was game, however. After a third attempt he succeeded in getting the line connected. But it is recorded that ever after he favored risking the lightning rather than the possible fury of his neighbors' hand generators."

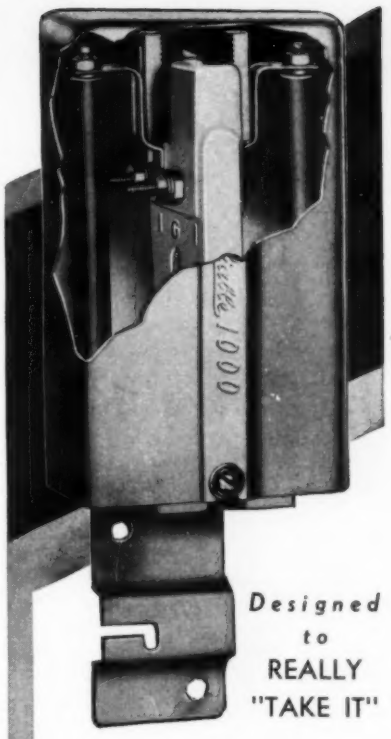
▼ ▼

Some Telephone Things I Didn't Know Until Now

By Oscar Will Tell

That automatic equipment now in process of manufacture will permit retirement of the last manual telephone office in New York City's Manhattan area.

That special pliers of the long nose and diagonal cutter type are now available with spring opening handles. Springs serve to keep the pliers open in position, ready for immediate use, without the necessity of opening up by hand. They are supposed to be a time-saver and a convenience.



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- **Seamless, Weatherproof Cover**
- **Corrosion-resisting Binding Posts**
- **Fuses and Air Gaps for Protection Against Static and Circuit Crosses**
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- **Approved by the Fire Underwriters' Laboratories**

Sample will be forwarded for inspection on your request.

"RELIABLE" IDENTIFIES THE QUALITY

Reliable ELECTRIC COMPANY

OVER 25 YEARS SERVICE TO THE UTILITIES

[illegible] CARROLL AVENUE CHICAGO, ILLINOIS

Commission and Court Activities

Illinois Commission Again Loses Its Chairman

Dr. Paul J. Raver of Oak Park, Ill., whom Governor Henry Horner appointed to the chairmanship of the Illinois Commerce Commission on July 26, was named administrator of the Bonneville Dam power project in Oregon, August 21 by Harold L. Ickes, Secretary of the Interior.

Dr. Raver has submitted his resignation to Governor Horner to take effect September 15, at which time he will assume his new duties. As a result the chairmanship of the Illinois Commerce Commission will become vacant for the second time since April. Dr. Raver, who had been the commission's executive officer for two years, succeeded James M. Slattery, who resigned as commission chairman when appointed United States Senator to succeed the late James Hamilton Lewis.

▼ ▼

Toll Rate Schedules Changed of Six New York Companies

The six largest telephone companies in New York state have been ordered by the New York Public Service Commission to change their toll rate schedules, effective August 1, so as to increase the initial calling period from three to four minutes for distances from 28 to 40 miles and to reduce the overtime charge from 10 cents to five cents per minute for calls between 28 and 34 miles.

The commission's order is directed against the New York Telephone Co., Rochester Telephone Corp., The Orange County Telephone Co., Upstate Telephone Corp. of New York, Jamestown Telephone Corp., and Chenango & Unadilla Telephone Corp. The revenue of the companies will be reduced approximately $200,000.

The order is the result of an investigation which the commission instituted into the divergence in charges for toll messages, particularly for messages which include overtime, over routes of between 22 and 34 miles. The rates for toll messages within New York state, with but few exceptions, are based upon a mileage schedule with the result that the rates for messages of like distances over all routes are the same.

With the changes now ordered by the commission, the schedule of mileage steps, initial period rates and the overtime charges for station-to-station messages for distances up to 120 miles will be as follows:

Distance: Up to more than	But not less than
8 mi.	.....
8 mi.	16 mi.
16 mi.	22 mi.
22 mi.	28 mi.
28 mi.	34 mi.
34 mi.	40 mi.
40 mi.	48 mi.
48 mi.	64 mi.
64 mi.	80 mi.
80 mi.	90 mi.
90 mi.	100 mi.
100 mi.	110 mi.
110 mi.	120 mi.

Commissioner Neal Brewster recommended the changes now ordered, in an opinion which the commission approved and which finds that because of the differences between charges for similar service, differing only as to distance between toll rate centers (for example, the divergence between the charges in the 22-28 mile and the 28-34 mile steps) such charges are "unduly and unreasonably preferential and prejudicial and unjustly discriminatory."

Commissioner Brewster's opinion calls attention to the fact that the widest divergence in the present schedule occurs between the 22-28 mile and the 28-34 mile steps. This divergence is such that for messages of five minutes or more the charge in the 28-34 mile step is just twice that in the 22-28 mile step. Such wide divergence does not occur in the schedule of charges for person-to-person messages.

The plan adopted by the commission and suggested by its telephone engineer is a plan modified so as to minimize the objection that in two mileage steps the overtime charges per minute exceeds the average charge per minute during the initial period. In the approved plan this objection exists only in the 34-40 mile step, in which the overtime rate is ten cents per minute and the average rate per minute during the initial period is 8¾ cents.

"No toll user should object because the overtime charge per minute in the 34-40 mile step exceeds the average charge per minute during the initial period, since through the lengthening of the initial period from three to four minutes, he would be getting an additional minute of conversation without additional charge," says the opinion. "This amounts to a reduction of ten cents in the total charge for all messages of over three minutes in the 34-40 mile step."

Initial Period		Overtime Period	
Rate	Minutes	Rate	Minutes
$0.10	5	$0.05	3
.15	5	.05	2
.20	5	.05	2
.25	5	.05	1
.30	4	.05	1
.35	4	.10	1
.40	3	.10	1
.45	3	.15	1
.50	3	.15	1
.55	3	.15	1
.60	3	.20	1
.65	3	.20	1
.70	3	.20	1

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Northwestern Bell's Depreciation Rate Is Set at 3.25 Per Cent

The Nebraska State Railway Commission on August 3 denied the request of the Northwestern Bell Telephone Co. to fix its depreciation rate for 1939 operations at 4 per cent, but increased the 1938 rate of 3.20 per cent to 3.25.

The commission arrived at this con-

clusion by application of its formula, which includes taking the average value of depreciable property over a period of years and the average debits to depreciation. For the last 20 years the average value of the company's depreciable property in Nebraska was $19,906,074 and the average debits to depreciation $644,940 a year.

The commission says no good reason has been shown why it should change its formula. The depreciation reserve of the company now stands in excess of 30 per cent of its depreciable property, and the commission apparently considers this ample in view of the high maintenance of the property as shown in its service condition of 82 per cent.

▼ ▼

Decision on Rehearing of Wisconsin Bell Case

No decision is likely upon the rehearing requested of the state supreme court by the Wisconsin Public Service Commission in the Wisconsin Telephone Co. case until some time in September.

An order was entered by the Wisconsin Supreme Court on August 3 according 30 days for the filing of the briefs in the case instead of the usual 20 days fixed by the supreme court rule.

The order was issued in response to a motion July 31 presented by the attorneys on both sides of the case. Under the order the attorneys for the state had until August 10 to file their briefs, and the attorneys for the telephone company until August 25 to present their reply.

The court will not ask for an oral reargument on the motion for rehearing. It will decide the case on the briefs.

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Switching Rates Raised on Oklahoma Forestry Lines

An extensive telephone system is owned and operated by the state of Oklahoma in timberland areas of McCurtain Le Flore and Pushamataha counties. This was brought out in connection with an order July 12 of the Oklahoma Corporation Commission granting S. B. Callaham, Broken Bow Telephone Co., at Broken Bow, Okla., authority to increase his switching rates for the state forestry lines, from $10 to $15 per month.

The Oklahoma state division of forestry, in connection with the United States forest service and with the cooperation of individual land-owners, offers fire protection to 1,400,000 acres of timberland in the foregoing area. The state owns and operates 525 miles of telephone lines, divided into 15 lines connected to lookout towers of the state forestry department.

In addition to giving free telephone service over these lines to forest rangers, the state gives free service also to 68 residents of the area. They make calls as far as 65 miles to Broken Bow without charge, or for a distance of 77 miles to Idabel by paying a toll charge calculated only on the distance from Broken Bow to Idabel, 12 miles.

The commission found that this condition, added to the regular requirements of the forest service, causes heavy switching demands at times on the Broken Bow exchange of S. B. Callaham and runs up the cost of his service to where the $10 monthly switching charge he has been receiving is insufficient. The state claims that the free service is given to land-owners to enlist their cooperation in fire prevention measures.

▼ ▼

Pacific Bell to Start Weather Broadcast Service

A revision of the ship telephone service schedule of the Pacific Telephone & Telegraph Co. was filed August 1 with the Washington Department of Public Service to become effective September 1.

The revision provides for the broadcasting at regular intervals of weather reports and storm warnings from marine radiotelephone station KOW near Seattle, Wash. Vessels using ship telephone service may, at a charge of 50 cents, under the new tariff request station KOW to repeat the weather report or storm warning last sent out from the station.

▼ ▼

Increased Rates Asked Following Equipment Change

The Southwestern Bell Telephone Co., July 26, petitioned the Oklahoma Corporation Commission for permission to increase certain rates at its exchange in Bethany, Okla., and to convert it from magneto to automatic dial equipment. The application was accompanied by a petition signed by 85 per cent of the Bethany business and residence subscribers approving the proposed reclassification of service and higher rates.

If the proposed schedule is approved, rates would be increased from $3.00 to $3.50 on single party business telephones; from $1.75 to $2.00 for two-party residence and from $1.50 to $1.75 for four-party residence. The one-party residence rate would remain at $2.25.

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Every operating company is anxious to obtain extra revenue. For those who do not now have adequate pay station coverage of their territory, we urge that they investigate Gray's complete line of Pay Station equipment. Pay Stations are proven revenue builders, and Gray Pay Stations are made for any size company and for any kind of equipment . . . magneto, common battery or automatic. Write Gray Mfg. Co. for a catalogue and prices today.

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STROMBERG-CARLSON TELEPHONE MFG. CO. of Canada Limited, Toronto, Canada.
CANADIAN TELEPHONES & SUPPLIES, LIMITED, Toronto, Montreal, Winnipeg and Vancouver
NORTHERN ELECTRIC CO., LTD., Halifax, Montreal, Toronto, Winnipeg, Regina, Calgary, Edmonton, Vancouver.
Or any other telephone supply house

Job's Trials

By ANNE BARNES

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

"IT IS A GREAT blessing to possess what one wishes," said an ancient philosopher.

"It is greater still," was the reply, "not to desire what one does not possess."

As I read those lines I thought of my mother, as she used to express the same thought, only more simply, by saying: "I never wanted what I could not have." That is the way she lived, too. It is a great way to live. It is like living in the middle of one's green pasture where the greenness all around predominates—even though at close range there are bare spots and weedy places. I gravely doubt whether many of us have such a philosophy of life.

On the contrary, many of us, whether we like to believe it or not, have the same philosophy of life as that of Mrs. Grummidge, who in the story of David Copperfield, said: "I am a lone lorn creetur' and everythink goes contrary with me."

These two life philosophies are as widely different as the two poles. Yet we telephone operators serve the two types as well as every other kind between. Many are "Job's Trials"—a large order—to us.

"But," say I, "if we haven't the right sort of dispositions, we have no business being telephone operators."

"Oh, I don't know," remarks Hetty Stone. "If we are trained operators and are able to hold our dispositions in check, regardless of how we feel, we get on with the best. Service is what counts, not 'What's your disposition?'"

Well, all I can say is that I would not like to be one of Hetty Stone's "Job's Trials." Her philosophy of life can be put on and off like a hat. And she has one for every occasion that suits her particular mood at the time.

In addition, a special Bethany-Oklahoma City district service would be provided at the following rates: Single-party business, $5.50; single-party residence, $4.50. Under this service no charge would be made for calls from Oklahoma City subscribers to Bethany district subscribers. Bethany district business subscribers would be entitled to make 20 calls to Oklahoma City without charge, all in excess to be charged at four cents per call.

All district service residence subscribers will be entitled to call and be called by all Oklahoma City subscribers at no extra cost.

▼ ▼

Court Upholds Validity of Telephone Directory Copyright

The Federal District Court, Pueblo, Colo., on April 25 granted a permanent injunction restraining the One Two Three Directory Co. from publishing or distributing copies of a numerical directory found to have been copied substantially from the copyrighted telephone directory of the Mountain States Telephone & Telegraph Co.

The defendants were ordered to deliver for impounding and destruction all infringing copies as well as plates, type, matrices, stencils or other means or devices for making infringing copies.

The court in making its findings said: "On or about June 26, 1935, the complainant (Mountain States Telephone & Telegraph Co.) compiled and published a telephone directory under the title of 'Telephone Directory of Summer 1935 for Beulah, Pine Drive, Pueblo, and Rye, Colo., Revised to June 1, 1935,' which directory was distributed as a part of its telephone service to the public; that there was a notice of copyright contained therein, and that the complainant has complied with the copyright laws of the United States of America.

"After the 26th day of June, 1935, the defendants commenced the compilation of a book or directory carrying on the outside cover the following: 'Pueblo, Colorado, One Two Three Directory 1935-36,' and published and distributed or caused to be published and distributed a large number of copies of this book which was copied substantially from the complainant's copyrighted telephone directory."

The court concluded that the telephone company had a good, valid and subsisting copyright upon its telephone directory and that the defendants in compiling and distributing the One Two Three Directory had infringed upon the telephone company's copyright to lists of names, addresses and telephone numbers of its subscribers.

▼ ▼

Barron County (Wis.) Company Acquired by Commonwealth

The Commonwealth Telephone Co., Madison, Wis., was authorized August 17 by the Wisconsin Public Service Commission to purchase the Barron County Telephone Co., Rice Lake, Wis., and issue $150,000 par value of common stock. The Commonwealth company will buy 1,535 shares of Barron County company common stock for $75,672.50.

The Commonwealth company had previously acquired 957 shares of the Barron County company stock for $81,435.50, and will now acquire 1,465 Barron County company shares held by the General Telephone Corp. for $69,722.50 and 70 shares from various individual stockholders for $5,950.

The issue of $150,000 par value common stock by the Commonwealth company will pay an equal amount owed to its parent corporation the General Telephone Corp., including payment for the Barron County company stock.

▼ ▼

Adjustments in Free Service Between Exchanges Authorized

The Commonwealth Telephone Co. has been authorized by the Wisconsin Public Service Commission to eliminate free long distance service between certain exchanges but is required to continue such service as to other exchanges.

The company in May asked permission to eliminate free toll service from exchanges at Ithaca, Lime Ridge, Loganville, Plain, Reedsburg, Ridgway, Spring Green, and Witwen. It also asked to eliminate a special toll charge between Reedsburg and Plain.

The commission authorized elimination of free long distance service and charging of standard toll rates between the company's exchanges and to exchanges of other companies.

It is provided, however, that free service shall continue to be given from the Ithaca exchange to all subscribers on the Lime Ridge exchange; from the Lime Ridge exchange to rural subscribers of the Reedsburg, Ithaca, and Loganville exchanges; from the Loganville exchange to subscribers of the

Lime Ridge, Plain, and Reedsburg exchanges; from the Plain exchange to the Spring Green, Witwen, and Loganville exchanges; from Reedsburg exchange rural customers to the Lime Ridge and Loganville exchanges; from the Ridgeway exchange to Barneveld and Dodgeville; from the Spring Green exchange to the Lone Rock and Plain exchanges; and from the Witwen to the Sauk City and Plain exchanges.

The company was permitted to establish its standard toll rate between Reedsburg and Plain.

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Summary of Commission Rulings and Hearings

Federal Communications Commission

August 11: Southern Bell Telephone & Telegraph Co. filed request for authority to supplement existing facilities between Harlan and Cardinal, Ky., and between Middlesboro, Ky., and Lone Mountain, Tenn.

September 18: Public hearing before the commission to bring about a legal determination of the FCC's authority over telephone rates where exchange areas extend over state lines. While the prepared data deals with the Southwestern Bell Telephone Co. and its extension of exchange areas across state lines, and elimination of toll rates, final decision will apply to many other areas in the United States.

Kansas Corporation Commission

September 6: Hearing on application of Southwestern Bell Telephone Co. for permission to file and put into effect a new schedule of rates in Andale and vicinity.

September 7: Hearing on application of Southwestern Bell Telephone Co. for permission to file and put into effect a new schedule of rates in Mt. Hope and vicinity.

September 8: Hearing on application of Southwestern Bell Telephone Co. for permission to file and put into effect a new schedule of rates in St. Paul and vicinity.

September 19: Hearing on application of Southwestern Bell Telephone Co. for authority to withdraw from telephone exchange operations in and about Benton and Towanda.

September 19: Hearing on application of Albert A. Warrell for a certificate of convenience and authority to transact the business of a telephone utility in and around Benton and Towanda.

Nebraska State Railway Commission

August 15: Application filed by Elmer Crisp, owner of Paxton Telephone Co., for authority to purchase from Northwestern Bell Telephone Co. its Danbury and Lebanon exchanges.

August 18: Approval given application of Lincoln Telephone & Telegraph Co. for authority to issue $3,500,000 of 3.25 per cent 30-year bonds to be exchanged for $3,500,000 of 3.75 per cent 30-year bonds due in 1965, and to sell the same at $103.25.

September 14: Hearing on application of Nebraska Continental Telephone Co. for permission to discontinue its exchange at Loretto.

September 18: Hearing on application of Lincoln Telephone & Telegraph Co. for authority to revise rates at its Julian exchange.

Minnesota Railroad & Warehouse Commission

September 11: First public hearing on complaints against the compromise rate order of May 2 which reduced rates of Tri-State Telephone & Telegraph Co. in St. Paul.

New York Public Service Commission

August 25: Hearing in New York City on complaint of Central Station Signals, Inc., vs. New York Telephone Co.

Ohio Public Utilities Commission

August 17: Joint application filed, by the three companies concerned, for authority by the Ohio Associated Telephone Co. to purchase for $28,889.97 all property of the Yorkshire Telephone Co., and for $18,424.41 all property of the North Star Telephone Co.

The purchasing company asks that upon the authorization of such transaction it also be authorized to issue appropriate securities to enable the financing of the purchases.

The values of the properties involved will be checked before the commission passes upon the application.

Wisconsin Public Service Commission

August 15: Viking Telephone Co., Door county, filed application for authority to increase rates from $10 to $13 a year. Application will be investigated at a hearing to be set later.

August 15: Liberalized extension rules ordered for the Commonwealth Telephone Co., Madison. The new rules will standardize the service extension policy for new subscribers in all its 110 exchanges and provide for construction of one-third mile of pole line with excess necessary to reach a subscriber contributed by the subscriber at the rate of $4 for each 100 feet.

August 24: Hearing in Waupaca on application of Rural Telephone Co. for authority to extend lines in Lind, Waupaca county, to serve four customers.

August 24: Hearing in Waupaca on complaint of Robert Radtke and Hilbert Klosterman that Bonduel Telephone Co. has refused to extend service to their homes in Angelica and Green Valley.

September 6: Hearing in Madison on application of Commonwealth Telephone Co. for authority to sell and abandon certain lines located in the towns of Highland in Iowa county and Castle Rock and Muscoda in Grant county.

September 6: Hearing in Madison on application of Philip P. McGuire and Joseph T. Novak for authority to transact business as a public utility furnishing telephone service in Castle Rock and Highland.

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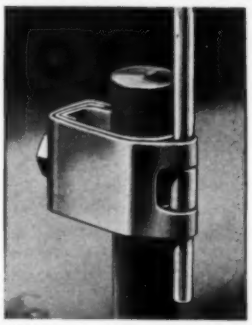
Maine Association Announces Convention Dates

Ellis W. Nash, of Damariscotta, Me., secretary-treasurer of the Telephone Association of Maine, has announced that the 1939 telephone convention will be held at Poland Springs on September 6 and at Lakewood on September 7.

CLAMP-TITE GROUND CLAMPS



FOR ROD

You can easily install or remove Kearney Ground Clamp-Tites, even from battered rods . . . Test their positive contact under expansion or contraction conditions . . . Note their flexible strap construction that adheres tightly to rod and conductor—to assure full contact surface and eliminate costly contact burn-outs under heavy ground discharges.

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Again, sound engineering principles have been incorporated into the design of Clamp-Tites used on pipe frame work and water pipe . . . Durable copper strip has mechanical and electrical features of rod style clamp . . . But you'll see profitable advantages of both under your ohm tests.

Ask for FREE Sample

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

DISTRIBUTED THROUGH JOBBERS

TELEPHONE ACCESSORIES

Death of Australian Pioneer of Strowger Automatic Service

ARTHUR A. BURCH, Sydney, Australia, chairman and managing director of Automatic Electric Telephones, Ltd., and for 28 years active in the commercial development of automatic telephony in Australia, passed away early Sunday morning, July 16, at Sydney, at the age of 63. Death came suddenly following a collapse which occurred on the previous evening, and was ascribed to coronary thrombosis.

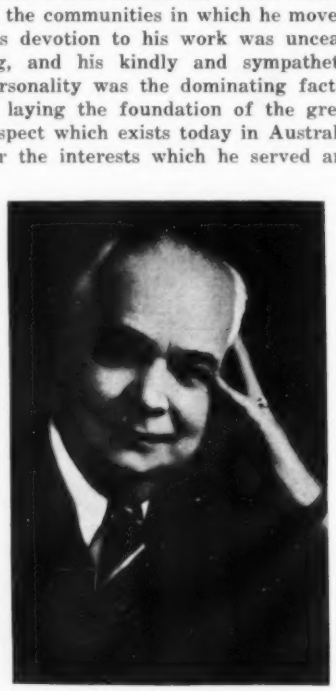
Mr. Burch's health had been noticeably declining for some months, but the suddenness of his passing was a profound shock to his many friends not only in Australia but also in other parts of the world where he had become well-known and esteemed among telephone men.

Although Mr. Burch spent the greater part of his business career in Australia, he was a native of Michigan, U. S. A. His association with the telephone business dated from 1889, when he entered the employ of the Bell System in Michigan. In 1904, he joined the Citizens Telephone Co., Grand Rapids, Mich., for which Automatic Electric Company had just completed one of its earliest and largest automatic installations. Thus began Mr. Burch's experience with the system which was destined afterwards to become the subject of his life's work.

In 1910, Mr. Burch was appointed by Automatic Electric Company to go to Australia for the purpose of introducing the merits of automatic telephony to the officials of the Australian Post Office. With the cooperation of local business interests, he organized the company which is today Automatic Electric Telephones Ltd., and which became the representative of Automatic Electric Company for Australia and New Zealand.

In 1911, Mr. Burch took to Sydney the first Strowger automatic telephone demonstration equipment. So successful was he in convincing the Australian Post Office officials that automatic equipment would meet the needs of the telephone users of that country that actual commercial installation was begun almost at once, and the next year witnessed the opening of the first exchange of the Sydney network. That Strowger equipment is standard throughout the principal cities of the Commonwealth today is due largely to the enthusiasm which Mr. Burch brought to his work and to his close and friendly cooperation with the officials of the Australian Post Office.

Mr. Burch earned the widest esteem of the communities in which he moved. His devotion to his work was unceasing, and his kindly and sympathetic personality was the dominating factor in laying the foundation of the great respect which exists today in Australia for the interests which he served and



The late ARTHUR A. BURCH introduced Strowger automatic equipment into Australia in 1911 and was active in its commercial development there until his sudden death in Sidney last month.

the telephone system which they sponsored. It was characteristic of his nature, and in the fullest accord with his often expressed wishes, that he retained active daily contact with his business affairs almost until the day of his death.

The high respect in which Mr. Burch was held in Australian business and social circles was evidenced by the hundreds of messages of sympathy which were received at his home and at his place of business, as well as by the large attendance at his funeral. The deep attachment which members of the Australian Post Office felt for him is indicated by the following message which was received by A. R. Filmer, of Automatic Electric Telephones Ltd., from R. Lawson, chief engineer of the department:

I should like your company to know how sadly we feel the loss of your late managing director, Mr. Burch, one with whom this department has had very long and very happy associations. It was due to Mr. Burch's efforts that the first automatic installations were made in Australia. In that respect, therefore, he and Mr. Hesketh, the then chief engineer, pioneered the service which has now become so very widespread.

The very happy official and personal relations existing between your company and this department owes a tremendous lot to the personality whose loss we now regret, and I would like you to let the home organization know what we feel about it.

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Guatemala City System to Be Rehabilitated

Complete renovations and extension of the automatic system in Guatemala City, Guatemala, in Central America is now under way, a contract covering the work having been awarded May 1.

It is reported that the existing telephone lines, numbering approximately 1,900, will be completely renewed and additional installation of equipment made to provide for a total of 5,000 lines. In addition to the renovation of the general telephone system the contract provides for the installation of complete telephone equipment in the Palacio Nacional, which is now under construction.

The estimated cost of the improvement to the city's telephone system is $360,000 and the estimated cost of the installation in the Palacio Nacional is $55,000. The contract provides that the work must be finished within a period of two years and nine months, but it is estimated that all installations will be completed within 2½ years.

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Company Tests Value of Radio Advertising

A 13-week test of the value of radio advertising to the telephone industry has been inaugurated by the Lincoln Telephone & Telegraph Co. through the use of a 15-second station-break "plug" announcement on the powerful KFAB station at Lincoln, Neb., which more than covers the company territory.

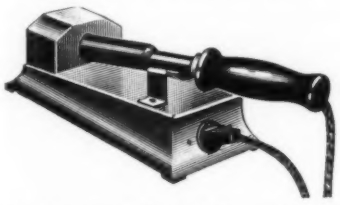
Every Tuesday and Friday evening, just before big-time programs change at 7 o'clock, a 25-word announcement is broadcast. Usually this is: "In just 15 seconds it will be 7 o'clock and the Lincoln Telephone & Telegraph Co.'s low night rates will be in effect."

It is believed that the regular reminders will make subscribers conscious of the availability of low-cost toll service. General Commercial Superintendent H. F. McCulla of the Lincoln company, has asked employes to be alert in catching subscriber reaction to this form of advertising.

The Manufacturers' Department

"Esico" Control Stand for Soldering Irons

A new type control stand for controlling the heat in an electric soldering iron when the iron is not in use was developed last year by the Electric Soldering Iron Co. Inc., Deep River, Conn. This time and money-saver has been further improved by the company and can now be used on either alternating or direct current.



New type control stand for controlling heat in an electric soldering iron.

Soldering operations require a very hot iron. In the past it was necessary to turn off the iron during periods of idleness or the continued high temperature would burn the tinned surface off of the tip.

The "Esico" thermostat control is so designed that any make of electric soldering iron may be used on it. The stand cuts the iron in and out of the circuit at any temperature selected for the work on hand. By controlling the heat in the iron, the control stand saves time for the workman, increases the life of the soldering iron and makes possible a real saving in electric current.

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New Method for Repairing No. 14 Cable Terminals

J. W. Channell, president of the Channell Splicing Machine Co., 8147 Seville Ave., Southgate, Calif., recently announced the perfection of a new method for repairing No. 14 type cable terminals when the binding post is broken back of the face plate.

In announcing the new method, Mr. Channell said: "In making a study of the causes of broken binding posts, it was found that the posts break due to shrinkage during a change in temperature and cause the cap-head to pull off, leaving a separation between the cap and the square shoulder of the post.

"When a post is found broken on a working line the practice has been to cut the line to a new pair; and when several posts are broken in one terminal, the practice has been to replace the terminal. Either method is costly and, in addition to expense, the replacement of a terminal disturbs other service working out of the terminal."

Mr. Channell states that his company has developed a tool for repairing broken binding posts and that the use of the new tool will restore service promptly and eliminate the costs of replacing terminals due to broken posts.

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Bethlehem's Exhibit at New York World's Fair

An educational display entitled "How Steel Is Made" is the central feature in the exhibit of the Bethlehem Steel Co. at the New York World's Fair. Entering the Metals Building the visitor finds his attention immediately attracted by a life size, 55-ton, all-welded ladle, suspended from the ceiling. The reddish glow from its contents of molten steel plays overhead while a stream of white hot metal —simulated by illuminated lucite— flows into a full-size ingot mould underneath.

Below this impressive display, in a circular arrangement, are six animated panels showing the principal operations in steel making, starting with a blast furnace, then an open hearth furnace, pouring platform, soaking pit, blooming mill, and typical finishing mills.

Sound recordings describe each step in natural sequence, while the construction and the operations of furnaces and equipment are vividly and realistically portrayed by colored lights and moving parts. Wherever possible the furnaces are shown in cross section, making the presentation more understandable as well as highly dramatic.

Three additional panels, which complete this display, give the quantities of materials required in the production of one-ton of coke, one-ton of pig iron, and one-ton of steel. The many different by-products obtained in these operations are also given.

Surrounding the central display are a number of supplementary exhibits.

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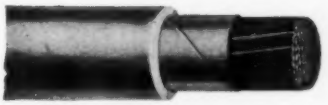
electrical
Wire & Cable



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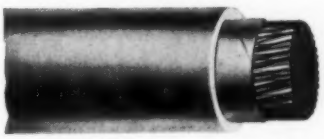

Telephone Cable... Paper Insulated and Leaded... 150 Pairs.

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JOHN A. ROEBLING'S SONS CO.
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ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING

This educational display showing how steel is made is the central feature in the exhibit of the Bethlehem Steel Co. at the New York World's Fair. The 55-ton, all-welded ladle is suspended from the ceiling. The ladle's contents of molten metal throw a reddish glow overhead and a stream of white-hot metal simulated by illuminated lucite flows into a full-size ingot mould.

One of the most popular features is a small stage unit where two robots—Mr. Wright and Mr. Brown—discuss steel making and the applications of steel. Mr. Wright, who knows steel making from the inside, talks particularly about the great care required in making all the different types of steel used today and how the highly-specialized requirements in modern uses of steel are met.

General uses of steel are portrayed in a 40-foot mural representing a typical community. Bright lights are first played on the mural to show the community as it appears on a clear, sunny day. Then the lights are dimmed and ultra-violet light is focused on the mural.

This light, in combination with a paint which is invisible in normal light makes the steel stand out in a striking manner, revealing a veritable skeleton of steel around which the community is built.

One section of the exhibit is devoted to Bethlehem products, including wire products, fence, wire rope, galvanized products, etc.

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Coffing Hoist Co.'s Two New Line Tools

Two new tools, known as the Liteline puller and the power pike pole, have been announced by the Coffing Hoist Co., Danville, Ill., manufacturer of safety-pull hoists and other utility maintenance tools.

The new Liteline puller, designed for pulling-in telephone and power line wires, is built on the ratchet or crank principle. Although the puller weighs only five pounds, the manufacturer claims that the puller has a rated capacity of 400 pounds and is factory tested at 100 per cent over rated capacity. The puller contains 12 feet of special steel tape that has a tensile strength of 2,000 pounds.

The Coffing power pike pole is built of two pieces of galvanized pipe, one telescoping the other. The pike pole, which weighs only 32 pounds, has a heavy steel base and its top is so constructed that it cannot slip off the pole. The minimum height of the pike pole is 8 ft. 2 ins. and the maximum height is 11 ft. 7 ins.

Power for operation of the pike pole is obtained through the use of a Coffing load-binder or safety pull-hoist. Either can be removed from the pole and used for other purposes. The manufacturer claims that for straightening leaning poles, one man can with the unit do the work of from two to six men.

▼ ▼

New Type Guard for Protecting Guy Wires

The Overton Flexibal guy guard, manufactured by the S. E. Overton Co., South Haven, Mich., is a complete departure from the conventional rigid-metal shields commonly used to protect guy wires.

Consisting of a series of bead-like spindles, 6 ins. long and 2½ ins. in diameter, strung together on the guy wire to the required height, the Flexibal guy guard is flexible and also plainly visible. The spindles are made of seasoned hardwood, shaped and sanded to rounding contours and specially finished with aluminum paint.

Each spindle has two hot-dipped galvanized nails inserted in bottom-drilled holes. A standard seven-foot guy guard set consists of 14 spindles with one positive cable clamp. The spindles are easy to install. They are merely placed on the guy wire and the two galvanized nails driven quickly into the bottom-drilled holes of the spindles. After the spindles have been installed they are locked in place at the top by a strong, rust-resisting cable clamp which is furnished with each set of guards.

When subjected to force the Flexibal guy guard gives with the guy wire. The manufacturer states that the guard will not break in two, or kink, when subjected to force and when the force is withdrawn the guard will assume its straight position.

The standard set of 14 spindles conforms to the eight-foot protection generally specified for guy wires. Other features of the new type guy guard include the lessened chance of injuries resulting from contact with the smooth, roller-shaped spindles, and the roller shape also minimizes chances for damages to cars and trucks that may run into the guy wire.

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P. M. Ferguson, Jr., Automatic Sales Representative

P. M. Ferguson, Jr., of the Chicago sales organization of American Automatic Electric Sales Company, has been appointed as this company's sales representative in part of Minnesota and in North and South Dakota, with headquarters at Alexandria, Minn. Mr. Ferguson is a native Minnesotan and brings to his work a thorough knowledge of telephone matters.

W. E. Huntley, who has been sales representative for this company in Minnesota and North and South Dakota, will in the future handle sales in eastern Minnesota and western Wisconsin with headquarters at St. Paul, Minn., as at present.

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Recent Prices in the Metal Markets

New York, N. Y., August 21: Copper—Steady; electrolytic spot, 10.50; export, 10.65. Tin—Steady; spot and near by, 48.85; forward, 48.50. Lead—Steady; spot, New York, 5.05@5.10; East St. Louis, 4.90. Zinc—Steady; East St. Louis, spot and forward, 4.75. Pig iron—Quiet; No. 2, f. o. b. eastern Pennsylvania, 22.00; Buffalo, 21.00; Alabama, 17.00. Aluminum, virgin, 99 per cent, 20.00.

Billington Made Executive Vice-President of Kellogg Company

H. E. BILLINGTON, sales manager of the Kellogg Switchboard & Supply Co. for the past 12 years, was made executive vice-president of the company on August 15. In taking this action the board of directors of the Kellogg company recognized the constructive work done by Mr. Billington since his first association with its organization September 12, 1927, as telephone sales manager.

H. E. BILLINGTON, appointed executive vice-president of Kellogg Switchboard & Supply Co. last week, has directed Kellogg sales since 1927 and has served as vice-president in charge of sales since March, 1937.

Throughout the depression years Mr. Billington, who became general sales manager April 6, 1931, maintained his sales organization intact and concentrated on developing new avenues of consumption for his company's products. He was made vice-president in charge of sales on March 30, 1937, in recognition of his effective work in stimulating sales, thorough analysis of sales possibilities, organizing and developing a sales staff of high morale.

Personal studies of sales possibilities gave him an excellent understanding of difficulties of operating men, with resulting ideas as to the trend of subscribers' desires regarding service and equipment. Cooperation of engineering, manufacturing and executive divisions of Kellogg company has resulted in new designs in Kellogg telephones and equipment, as well as new products, along lines indicated by these contacts with the problems of the operating field.

Prior to his 12 years of Kellogg sales direction, Mr. Billington had five years' experience in the telephone field as well as sales and manufacturing experience in other lines of production. And during the world war he was a captain in the artillery service with an overseas record in France.

During his years in the telephone field he has made many friends who will extend congratulations upon his latest promotion to the executive vice-presidency of this well-known Independent telephone manufacturing organization. His wide experience, capacity for hard work, knowledge of the field and ability in handling satisfactorily the many problems which have arisen all qualify Mr. Billington to make an excellent record in his new position.

The Kellogg company is now well-established in its new million-dollar manufacturing plant and general offices at 6650 S. Cicero avenue, Chicago, occupancy of which was completed February 15, 1938. This is located in what is known as the Clearing industrial district, a section of Chicago developed in recent years as a manufacturing center. In its new quarters the company is well situated as to manufacturing and shipping facilities.

This modern plant is laid out with special reference to the efficient carrying out of manufacturing operations connected with the production of Masterphones, Masterbuilt switchboards and other equipment and parts used in telephone work.

Straight-line production methods are employed which move the finished products quickly and conveniently from final inspection to the shipping department or stockroom as the case may be. Direct switch tracks of the Chicago Belt Line Railway bring the freight cars into the building convenient to shipping and receiving departments. Loading and unloading platforms for motor trucks and trailers are likewise incorporated inside the building.

The new plant, which includes a two-story office building and a modern research laboratory, is the fourth occupied by the Kellogg company in its more than 42 years as a leading manufacturer of Independent telephone equipment and apparatus. The erection of this plant during the depression years was a strong testimonial as to the Kellogg company's belief in the future of the Independent industry. The former plant in Chicago was the center of the company's operations for a period of 23 years.

Under the direction of Mr. Billington as executive vice-president, the company's future progress should be even more noteworthy than in the past.

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Employes Learn Company's Departmental Operations

Officials of the Indiana Bell Telephone Co. at the Indianapolis office have started an innovation to better acquaint employes with the organization as a whole. Each day 10 or 12 employes of one department are taken through the entire plant and the workings of each department explained.

According to Vedder Gard, head of the public relations department, few employes, because of the nature of their work, ever see anything but their own department and they do not realize how their department dovetails with the other departments.

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Condensed Telephone News

New Companies and Incorporations

Plains, Texas.—The Belmont Telephone Co. has been organized and incorporated with a capital stock of $5,100. The incorporators are: D. B. McGinty, A. E. McGinty, and Don C. McGinty.

Stations

Los Angeles, Calif.—A gain of 1,616 stations for the month of July by the Southern California Telephone Co. raised the total number of stations in operation, as of July 31, to 716,990. The gain for the first seven months of the current year was 15,205. Last year, the July gain was only 1,464 stations and for the first seven months, 10,091.

New York, N. Y.—General Telephone Corp. reports for its subsidiaries a net gain of 1,219 company-owned telephones for the month of July, as compared with a net gain of 486 telephones for July, 1938. The net gain for the first seven months of 1939 totals 13,640 (exclusive of purchases and sales) or 2.96 per cent as compared with a net gain of 7,474 telephones or 1.68 per cent for the corresponding period of 1938.

The subsidiaries now have in operation 472,707 company-owned telephones.

Cleveland, Ohio.—The Ohio Bell Telephone Co. has reported a gain of 811 telephones in use in July against a loss of 1,685 in July, 1938. There was a gain of 23,795 in the first seven months of this year, against a loss of 2,882 in the same period last year.

Columbus, Ohio.—Ohio Bell Telephone Co. connected 1,210 telephones here during July, against 1,145 disconnections, making the total number of stations 83,915 in service in the local exchange area.

Gains for July dropped below the average for the year but still compare favorably with a loss of more than 200 in the same month in 1938.

Construction

Byron, Ill.—Mid-West States Telephone Co. is rebuilding the local exchange at a cost of over $10,000. Over 1,100 poles and 150 miles of wire will be used in making replacements in the rural areas. In addition to renewing the rural lines, new copper toll circuits will be constructed to Rockford and Oregon, Ill. Under-river cable at the bridge across Rock River will replace the present overhead construction.

Elizabeth, Ill.—Northwestern Telephone Co. has constructed approximately 16 miles of new open-wire line in the vicinity of Elizabeth, Hanover and Schapville. New poles and steel wire have been used in the work.

Kampsville, Ill.—A new automatic-dial telephone system was inaugurated here early in June.

This is the second dial equipment to be installed by the Pike County Telephone Co. in Calhoun county. Long distance calls for Kampsville will be handled through the Hardin exchange.

Rockport, Ill. — Pike County Telephone Co. has completed the local installation of automatic dial equipment.

Witt, Ill.—Illinois Consolidated Telephone Co. has started on a $50,000 program to give Farmersville, Harvel, Waggoner, Irving and Witt automatic dial service.

Albany, Ind.—Installation of automatic-dial equipment in the new exchange buildings of the Indiana Bell Telephone Co. here and in Eaton, started in June. The automatic-dial system will probably be placed in service the latter part of August. New dial substation equipment will be installed on the premises of all Eaton and Albany subscribers. Each of the communities has approximately 250 subscribers.

Adel, Iowa.—The Northwestern Bell Telephone Co. has announced it will build a telephone exchange and office building here this year. The cost is estimated at $27,000.

Alta, Iowa.—Construction of an office building to house the new automatic dial equipment to be installed here by the Northwestern Bell Telephone Co. was recently started.

The new equipment will be installed and all telephones replaced early this fall. The total cost is estimated at $27,000.

Anthon, Iowa.—Automatic-dial service will be introduced to both town and rural telephone users, now served by the local exchange, the latter part of the year. The improvement will cost about $27,000, according to announcement of the Northwestern Bell Telephone Co.

Hedrick, Iowa.—Iowa-Illinois Telephone Co. is making extensive improvements to the local exchange. The improvements which will cost approximately $1,000, involve the rebuilding of part of the open-wire lines and construction of new lines.

Ottumwa, Iowa.—Northwestern Bell Telephone Co. has announced a $50,000 improvement program here, rebuilding outside plant equipment and constructing new facilities in the next few months.

Shrewsbury, Mass.—The local automatic dial system was cut into operation on July 26 by employes of the New England Telephone & Telegraph Co. The installation and construction had taken about three months. Approximately 50 miles of cable was used to provide service to the 700 subscribers, of which only 100 have party lines.

Bay City, Mich.—Officials of the Michigan Bell Telephone Co. have announced plans for the construction of a new $700,000 automatic-dial equipped telephone building here. The announcement was made by T. N. Lacy, vice-president and general manager of the company.

Laingsburg, Mich.—Work has been started on a new building for the Michigan Associated Telephone Co. The building will be a 14 ft. by 18 ft. brick and cement structure with copper trim. It will be equipped with a new switchboard and at some future time an automatic dial system will be installed.

Norway, Mich.—Michigan Bell Telephone Co. plans to change the local exchange from magneto to automatic dial operation during the night of October 7.

A crew from the company's Iron Mountain headquarters has been working on the $19,000 project since June.

Fostoria, Ohio. — Ohio Bell Telephone Co. will lay a new toll cable under ground between Fostoria and Findlay this summer as a part of the general improvement and construction program which includes a new building here and a change to the automatic system.

Salineville, Ohio. — The Ohio Bell Telephone Co. started operation of its new automatic dial equipment here on July 22. Cost of the new equipment, including the new building, was $16,000.

Capron, Okla.—A new telephone system, to replace the one destroyed by a storm last April, was opened August 4 by the Driftwood Telephone Co.

The equipment, installed in a new exchange building, can serve 150 subscribers. All cable has been placed underground.

Chelsea, Okla.—Southwestern Bell Telephone Co., on August 11, conducted open-house, celebrating the opening of the local common battery exchange which replaces the old magneto system.

The new installation included a one-position switchboard, equipped for 300 lines. The improved equipment was installed in a leased headquarters building upon which the company has been working since May 1.

Spring City, Tenn.—Officials of the Southern Bell Telephone & Telegraph Co. have announced that an automatic dial system will be put into service here this month.

Miscellaneous

Montreal, Quebec, Canada. — Bell Telephone Co. of Canada has advised the Montreal (Quebec, Canada) Stock Exchange that the company has authorized the Montreal Trust Co. to register 501 additional shares capital stock, making the total number of shares issued 804,607.

Evansville, Ind.—John H. Baldwin, a member of the construction department of the Indiana Bell Telephone Co. was presented with a bronze Vail medal at a dinner recently held here. F. A. Montrose, vice-president and general manager of the Indiana Bell, made the presentation. More than 90 employes attended the dinner. Mr. Baldwin received the medal for giving effective first-aid treatment to two victims of an automobile accident which occurred near where he and his crew were working last year. He received first-aid training in the course of his telephone work.

Advance, Mo.—Mrs. Belle Burks has retired as operator for the Southeast Missouri Telephone Co. after 34 years of service. She was succeeded by Mrs. Savannah Crawford, who was transferred from Chaffee.

Warrensburg, Mo.—W. L. Bryant has been appointed division commercial superintendent for the Central Missouri Telephone Co. here. He succeeds Charles Zink who has been transferred to the purchasing office at Newton, Iowa, from which place he will also manage the Kansas State Telephone Co.

Mr. Bryant was group manager for the Central Carolina Telephone Co. at Southern Pines, N. C., prior to his transfer here.

Maywood, Neb.—William E. Embrey is the new owner of the Maywood & Carrico Telephone Co. Mr. Embrey has been with the company for a number of years, and purchased nearly all of the stock from the estate of the late Harry Hall.

New York, N. Y.—T. E. Shea has been elected vice-president of Electrical Research Products, Inc. Mr. Shea, formerly of Bell Laboratories, Inc., succeeded H. G. Knox, who resigned on the advice of his physician.

Columbus, Ohio. — Employes and former employes of the revenue accounting department of the Ohio Bell Telephone Co. who entered the service of the company during the period from 1913 to 1918 have formed an organization of more than 150 members. It is known as the Ohio Bell R.A., 1913-1918 Club.

A. E. Brown, division auditor has been elected president. Other officers chosen are: Miss Nell Quinliden, first vice-president; Miss Ann Netting, second vice-president; Ernest H. Blyth, treasurer; and Mrs. Grace Owens Randolph and Alma Brauch, secretaries.

Shelby, Ohio.—Frank B. Knefel of Columbus on June 24 was named to succeed Charles W. Wilson of Bucyrus, as manager of the Shelby Telephone Co. Mr. Wilson will continue as manager of the Bucyrus branch of the company.

Mr. Knefel comes to Shelby from the Kellogg Switchboard & Supply Co., Chicago, Ill.

Mr. Wilson has worked for the telephone company since 1899 when he started as a water boy for the construction gang. He was later made manager of the Shelby branch and then the Bucyrus plant.

Earlsboro, Okla. — John Mason, owner of the Canute Telephone Co., Canute, has purchased the local exchange of the Earlsboro Telephone Co.

Headrick, Okla. — Harold Peterson has purchased the local exchange from H. H. Harris, who owns the Drummond and Martha exchanges.

Webb City, Okla.—The local telephone exchange has been purchased by J. I. White, owner of the Wynona Telephone Co., which operates at Shidler and Wynona.

Groton, Vt.—M. E. Beckley, general manager of the Molly's Falls Telephone Co. of Marshfield, recently celebrated a double anniversary. On June 29 Mr. and Mrs. Beckley were surprised by a group of telephone people on the 40th anniversary of their wedding—and the same day was also Mr. Beckley's 69th birthday. The group of visitors included the officers of the company and operators of the Groton and Cabot exchanges.

Obituaries

Pomona, Calif.—Another link with the past was broken recently when Mrs. Bertha Hurtt York passed away in this city. Mrs. York was Pomona's first telephone operator and handled the switchboard in a local drug store when there were but 12 subscribers. Mrs. York was born in Peoria, Ill., in 1869. She came to Pomona with her family in 1889. Following her work at the first local exchange, she attended normal school in Los Angeles and became a teacher.

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Pennsylvania Bell Operator Given Vail Medal

Miss Anna V. Reilley, of Philadelphia, operator for the Bell Telephone Co. of Pennsylvania, was recently awarded a Theodore N. Vail Medal for noteworthy service to the public. Miss Reilley was on a vacation trip in New York City March 6, 1938, when fire broke out in her hotel during the night. She rushed to the switchboard to aid the night operator for three hours in reassuring anxious guests until the fire emergency was over.

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T. M. Partridge Lumber Co., Minneapolis, Minn.—Northern White—Western Red Cedar Poles. Plain or butt-treated.

Valentine Clark Corporation, 2516 Doswell Ave., St. Paul, Minn.—Finishd Cedar Poles. Plain or butt-treated.

Western Red Cedar Company, P. O. Box 663, Sandpoint, Idaho.—Plain or butt treated Western Red Cedar poles.

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Western Elec. No. 46 central battery ind. coils @	.50
Western Elec. No. 1269A main frame protectors with heat coils and carbons, per bank 20 lines @	12.00
Kellogg No. 115 desk type Grabaphone handset complete with 3 cond. cord less signal set (Wired for use with any standard signal case) @	4.50
Western Elec. No. 20 desk stand with new cabinet, 3-bar 1000-1600 or 2500 ohm ringer signal set, $10.00; 4-bar, $10.75; 5-bar @	11.50
Monarch No. 33 desk set with 3-bar 1000 ohm ringer inside connection Monarch signal set @	7.85
Double pole, double throw 15 Amp. knife switches @	.25

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BUCKEYE TELEPHONE and SUPPLY COMPANY
COLUMBUS, OHIO

VACUUM TUBES AS VOLTAGE AMPLIFIERS

(Concluded from page 11)

The voltage, E_g, impressed on the grid of the first tube is amplified to μE_g, and this voltage is impressed on the primary of the first transformer. Over the intermediate frequency range where the 1 to 3 ratio holds, this voltage is increased by the transformer to a value, $\mu E_g N$, where N is the effective turns ratio. This voltage is then impressed on the grid of the second tube, where it is amplified and impressed on the primary of the second transformer.

It is then stepped up by this second transformer and appears as the output voltage, E_o, across the secondary. Assuming identical tubes and transformers, the voltage gain per stage becomes μN. For Fig. 5 the output voltage of the complete amplifier is $E_o = \mu^2 N^2 E_g$, and the voltage amplification is $A_v = E_o/E_g = \mu^2 N^2$. With a transformer, high gains per stage are obtainable.

Amplification in Decibels

The *voltage* amplification in decibels for any of the amplifiers considered can readily be computed. The word *voltage* is in italics to prevent confusing with power amplification. The voltage gain in decibels is $db = 20 \log_{10} A_v$, where A_v is the voltage amplification; that is, the ratio E_o/E_g. Those not familiar with the use of logarithms can determine the gain in decibels by consulting tables in handbooks and textbooks.

Summary

In this article, the theory of voltage amplifiers and simple method of design have been included. The treatment is of necessity condensed, but the basic points have been presented so that further study of the subject is made quite easy. It has been necessary to omit entirely such subjects as the operation of amplifiers from alternating power circuits. Such amplifiers use rectifiers for supplying the direct plate and grid voltages. Such design details are readily available in tube manuals and handbooks.

The approximate calculations of amplification as here presented are satisfactory for most purposes. Volume controls are usually included in the circuits to make possible an adjustment of the exact voltage gain desired. Voltage amplifiers are often used to drive power amplifying stages which will be treated in the next article of this series.